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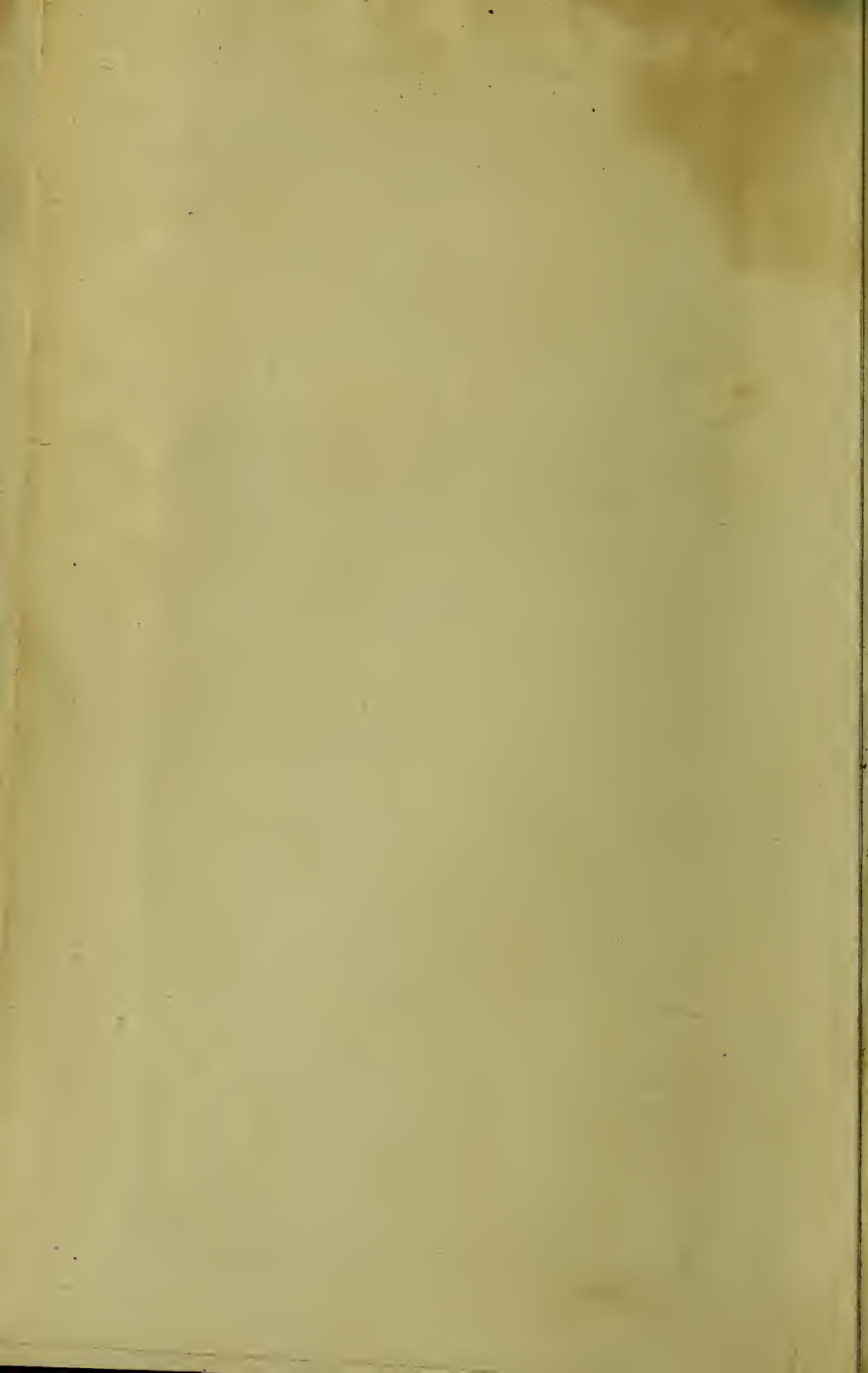
George Hart
July 2. 1879.

GARDEN FERNERIES.

To the Editor.

SIR,—In my remarks on “Garden Ferneries” in the July number of the Garden Supplement, the *Athyrium filix-fœmina* was the last fern under notice. The *Aspleniums* come next for consideration; they are small ferns, but a very interesting genus. To begin with *Asplenium septentrionale*. This is a very rare species in Britain, but not so much so in Switzerland, so that it is often brought over, and as often perishes for want of proper treatment. Plant it in a small pot with a little peat soil, silver sand, and a large quantity of tiny pieces of broken pots, so small as to be almost like grains, be careful in potting to let it be close to the side of the pot, and place a piece of the broken pot on its other side, patting the whole firmly together. If possible, it is desirable not to leave the pot out the whole winter, merely plunging it in the fernery for the late spring, summer, and autumn. This precaution is not so much needed on account of the cold of our climate, but from the damp, as, if water gets hanging about it, it is the certain forerunner of death. *Asplenium germanicum* is still rarer. It requires the same treatment as *septentrionale*, but, in addition, the protection of a bell glass, if grown out of doors, is necessary, but I do not advise its being left out in the winter. *Ruta-muraria* is a very troublesome fern to manage; the only successful plan is to pot it without any mould whatever, merely with tiny pieces of broken pots and old mortar. Let the pot be sideways, and the fern near the edge of it, between two pieces of brick firmly planted with the material explained above. *Viride* is another fern that is often lost, and the reason is for want of proper drainage, and consequently it is desirable to plant it in a pot in the outdoor fernery; let there be plenty of pieces of brick among the gritty porous soil, and, if left out in the winter, a bell glass is indispensable for its existence. *Trichomanes* is very hardy, and if planted between stones in a shady spot will make a fine object; let there be good mould between the stones. *Marinum*.

Barracl. Garden Supp. 14. Sept 27. 1850.





1. Royal Fern.

2. Moonwort.

2. Adder's Tongue.

FERN BOOK

FOR

EVERYBODY.

CONTAINING

ALL THE BRITISH FERNS.

WITH

THE FOREIGN SPECIES SUITABLE FOR A FERNERY.

BY

M. C. COOKE,

Author of "A Plain and Easy Account of British Fungi," "Microscopic Fungi," "A Manual of Botanic Terms," &c., &c.



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P R E F A C E.

YEAR by year a larger number of persons are becoming interested in Ferns, and ambitious of cultivating them in their dwellings. This commendable taste, and laudable ambition, it is the aim of the present "Fern Book" to foster. It only professes to be a plain and easy guide to the study or cultivation of plants well known and often described before; hence, it contains nothing sensational or new, unless it be an increased effort to be plain and popular, so that persons who know nothing of the science of Botany or its technicalities, may learn something about Ferns. Whilst all the British species are described and figured, and hints given for their cultivation, a number of hardy foreign species are also introduced at the close, with such observations as were required to render such a list acceptable to the amateur cultivator of Ferns. It is hoped that in all things the humblest artizan who desires to grow a Fern on his window-sill, or the more favoured possessor of a Wardian case in his drawing-room, will find the present what it professes to be, "A FERN BOOK FOR EVERYBODY."

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A

FERN BOOK FOR EVERYBODY.

FERNS! FERNS!!

THAT we may begin fairly with our history of this very interesting and exceedingly popular section of the vegetable world, it will be necessary for a moment to call to mind the names, form, and appearance of all the plants of which we have any knowledge. This vision will assemble together trees, shrubs, herbaceous plants, ferns, mosses, seaweeds, lichens, and fungi. If we proceed still further, and try to picture to ourselves the flowers which are borne by this endless variety of plants, we shall, perhaps, for the moment be puzzled. Some of them, it is true, bear flowers with which we are so familiar that we cannot fail to remember; but others bear flowers so small and inconspicuous, that, unless we have looked for them, it is quite possible that they may never have been observed. Yet, although we may not remember to have seen them, the oak, elm, beech, birch, and maple bear flowers as truly as the primrose, buttercup, and daisy. All these forest trees, shrubs, and plants of the woodland and the garden bear distinct and positive flowers, and are, therefore, called "flowering plants;" whereas ferns, mosses, seaweeds, lichens, and fungi appear to have no flowers at all, and have been called "flowerless plants." A more

correct appellation is *Cryptogamia*, which means "hidden flowers," because all of them have organs which produce seeds or spores (the great object of all flowers); the floral envelopes, such as the gay and often gorgeously tinted petals, being absent. The floral organs in many of the *Cryptogamia* are so deeply concealed, or masked under such peculiar forms, that they fully merit the title which has been given to them. In the higher *Cryptogamia*, or those which approach nearest to flowering plants, as ferns and mosses, the reproductive organs (flowers if you please) are less concealed than in the lower *Cryptogamia*, such as *algæ*, lichens, and fungi.

Ferns, therefore, belong to the higher *Cryptogamia*, of which they constitute a most important section, and are distributed all over the world, except the cold Polar regions. In some countries they equal one-ninth part of all the flowering plants which the country is known to produce, whilst in others they scarcely exceed in number $\frac{1}{200}$ th of the flowering plants. They are to be found in Greenland, Iceland, and the North Cape, all over the tropics, as well as the temperate regions between, and are plentiful in the Australasian islands. The number of known species is very uncertain, fluctuating according to the opinions of different pteridologists as to what constitutes a species. Some have placed the maximum at 2,000, others consider the minimum to be double that number. Sir W. J. Hooker described 2,500 species in his "Species Filicum," more than twenty years ago, and Mr. John Smith thinks that, with the additions since made, the number will not fall short of 3,000. This, therefore, may doubtless be accepted as an approximate estimate of the number.

That ferns are very beautiful, highly ornamental, and consequently attractive, will be admitted; but the utilitarian will be anxious to learn "what are their uses?" Such a querist will hardly receive a satisfactory answer if he confines the meaning of his word "use" to market value or economic application. It is true that the *materia medica* derives small additions from ferns. A kind of food

in extreme cases has been found in the rhizomes of a very few species. But for clothing or shelter, resin, gum, oil, balsam, starch, dye-stuff, or any other product of the vegetable world which has its use and its market, none of these can be traced to ferns. Some consolation, amid this dearth of uses, is afforded by a letter which appeared in a popular journal of science nearly two years ago. The writer says, "Doubtless many have observed, when passing the shops of large fruiterers in London and elsewhere, apples, pears, and other fruit packed in hampers containing fern-leaves; and had they but inquired why these leaves in particular were used, the more intelligent of the vendors would probably have told them they assisted in preserving the fruit from mildew and decay. Some years ago, when residing in the Isle of Man, I noticed that the bracken was in large demand for packing the fresh-caught herring forwarded daily by steamboats to the Liverpool markets; and more recently, during a brief sojourn at Frodsham, in Cheshire, brackens were collected on the Overton Hill to line the hampers of new potatoes transmitted to the Manchester markets. Upon my return to the north of England, in a year when the potato disease was threatening the destruction of that valuable esculent, the rector of a parish in my neighbourhood, at my suggestion, induced one of his farmers to 'hog' his winter potatoes on the ground where they grew, and to cover them with bracken instead of the customary straw. The farmer, sceptical about the result, only covered half the 'hog' with ferns, leaving the other half protected by straw, earthing and sodding up the mound to exclude rain and frost. Winter arrived, and the 'hog' was opened for a fresh supply of tubers, when it was discovered that those potatoes which had been stored in brackens were sound and good, whilst those protected by straw were so much decayed as to be scarcely worth the labour of removing." And in confirmation of the testimony afforded by this correspondent, Miss Gifford states that the country people in Somersetshire thatch over their potato "buries" with it, saying that they keep better under it than when

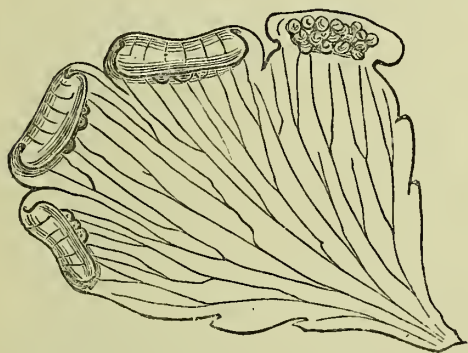
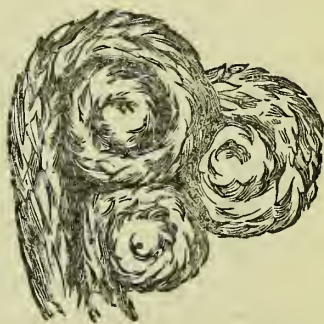
straw is used. And in controversion of the assertion that ferns did not afford food for man or beast, she adds, "Our Exmoor ponies crop its young fronds with avidity, and donkeys also eat them and other common ferns. In India, New Zealand, &c., several kinds are used as food; and it is possible that the ferns of these countries may be more tempting to the insect tribe than they are with us. In the "Botanical Chart" of my lamented friend, Miss Warren, it is stated, that in the north of Europe starch is made from the roots of *Osmunda*, and bread from those of the *Bracken*, and that, in the times of Henry VI., the people of England were reduced to the use of this bread.

Notwithstanding the above remarks, it cannot but be admitted that ferns are of very little direct use to man in the arts, or to furnish the necessities of life. Whether this is not compensated for in other ways, and whether we are to measure the value of everything by the standard of meat and drink, is another question. "Let each be persuaded in his own mind."

A little experience will soon enable the most complete novice to distinguish a fern from any other plant, and this is especially the case with our own British species, or those in common cultivation. One safe guide may be noted for the majority of species when in a fertile condition, that the backs, or under side of the leaves, have clusters of minute brown cases in roundish tufts or elongated patches, containing the dust-like seeds, or spores. Other plants, not at all allied to ferns, are often attacked by parasitic fungi, which burst through the cuticle of the leaf in just such patches of brown dust, and so much resemble ferns, at a casual glance, that even botanists have in former times been deceived, and supposed them to be a kind of fern. Another useful guide will be found in the veins of the leaves. In most leaves one stout vein, or mid-rib, runs from the base to the apex of the leaf, dividing it into two nearly equal parts. From this mid-rib other veins run direct to the edge of the leaf, or else they become branched in a very irregular manner. In ferns, on the contrary, the veins divide regularly in a

forked manner, each fork being again divided into secondary forks. This regular forking of the veins of the leaf is a great assistance in determining whether any unknown leaf belongs to a fern or not. (Fig. 1.)

By comparing the leaf of any known fern with that of a tree, or a common herbaceous plant, the difference of type in the venation, or arrangement of veins, will be evident. There is one other distinction which may be indicated as affording additional aid in determining a fern from any other plant. When the leaves, or fronds, of a fern first make their appearance, and unfold above the

*Fig. 1.**Fig. 2.*

soil, their method of doing so is peculiarly characteristic. The upper portion of the leaf is coiled inwards like a watch-spring, and as it unfolds, the coils loosen or unwind, and present the appearance indicated in our woodcut. (Fig. 2.)

Such a mode of unfolding of the leaf is confined chiefly to ferns, and there are only two or three of the British species which do not unroll in this manner. Hence we may observe that, in bearing the seeds on the back or edge of the leaf, in having the veins of the leaves regularly forked, and in the young leaves unfolding in a spiral manner, ferns differ from other plants, and by these features may be readily distinguished.

STRUCTURE OF FERNS.

In order to understand the descriptions and other allusions to the different parts of the plants under consideration, it will be necessary to devote a little attention to their structure, and to explain the terms which it will be impossible wholly to exclude. If accuracy is to be maintained, it is important that correct terms should be used, and if the meaning of these terms are at first thoroughly understood, the reader will experience no inconvenience from their employment. It is a mistake to jump at the conclusion that scientific terms are only necessary to the rigidly scientific student, or that a popular work is most satisfactorily performed from whence they are wholly excluded. If the meaning and application of such terms are first made clear, their employment is manifestly an advantage both to the reader and the writer.

Those organs in ferns, which most persons would at once call the leaves, and which resemble in many particulars the leaves of ordinary plants, are generally designated *fronds*. The chief distinction which it is necessary for a popular purpose to indicate between a leaf and a frond, as applied to ferns, is, that the latter bear at the margin, or on their backs, the organs of fructification; that is, the seed is produced from some portion of their surface. These fronds are traversed by veins, which are usually forked, but diverse in their arrangement, sometimes parallel, and sometimes radiating.

The fronds of ferns, as well as the leaves of many ordinary plants, are borne on a stalk, to which the name of *stipe* is applied. When, therefore, we write of the *stipe* of a fern, we mean thereby what would be called the "leaf-stalk" of a flowering plant. The stipes are attached at their lower extremity, or grow from, a root-stock or rhizome, which is all the stem our indigenous ferns possess. In the large tree-ferns this stem is elongated in a trunk-

like manner; but, if examined, the structure will be found precisely similar, on a larger scale, to the root-stock of our common Male Fern: that is to say, the stem is composed of the bases, or lower portions, of the old stipes which have decayed and fallen away year by year, as new fronds have consecutively grown at the summit, to die and fall away in their turn, and leave the lower portion of their stipes as a contribution towards lengthening the stem of the fern. Hence it will be evident that neither the root-stock of the Male Fern nor the stem of the tree-fern at all resemble the stem of a shrub or the trunk of a tree, and it is, in fact, only an elongated root-stock, scarcely meriting the name of a stem.

From the under side of the root-stock when creeping, and from all sides when erect, the tough fibrous roots descend into the soil. These are the true roots. There are various modifications in the form of the root-stock, which may be studied and compared with advantage in the common Bracken, the common Polypody, and the Male Fern.

It may be observed here that the vascular bundles of the stipes of ferns furnish the scalariform tissue so well known to microscopists, to obtain which for microscopical examination the following method has been recommended: "The fern stipes, cut into short lengths, should be boiled in a solution of caustic soda (about thirty grains to the ounce of water) for a quarter of an hour or so; then take them out and crush them well in a mortar, replace them in the solution, and boil again for five or ten minutes, when they will be found to have become quite soft, the cuticle can then be picked out and thrown away. Allow all the fine fibres to settle, pour off the dark-coloured fluid, and boil them three or four times in water, adding to the last water a few drops of hydrochloric acid, which whitens the mass considerably. On crushing a little of this fibre in a 'live-box,' the scalariform ducts may be easily seen, their position noted, and, on removing the cover, picked out. The ladder-like markings are best seen when mounted in fluid."

It has been remarked that the fructification of ferns is borne on the back or margin of the fronds, or more rarely occupies the whole surface of special and metamorphosed fertile fronds. It is the fructification which appears in brown dots or lines, or confluent masses, on the under surface of the fronds of our common ferns. The dots or lines, which are only visible as such to the naked eye, when examined by a lens or the low powers of a microscope are found to consist of clusters or tufts of brown capsules, which are the *thecæ* or spore-cases. A single capsule is a *theca*, but a cluster of them as they grow, whether in a circular tuft or in an elongated cluster, is called a *sorus* (from *soros*, Greek for "a heap"). The *sori* are occasionally naked, but more commonly covered, in the first instance at least, with a membranaceous covering called an *indusium* (Latin, "a shirt"), or *involucre* (*involucrum*—Latin, "a cover"). The presence or absence of this cover, and its form, when present, are of great importance in determining the genus and species to which a fern belongs. It may be kidney-shaped, and attached by one side; or circular, and attached at the middle; or attached all round, and breaking at the apex when mature, enclose the spore-cases in a kind of cup; or the overlapping of the margin of the frond may constitute a kind of cover or indusium. The form is variable, and hereafter it will be seen how this variation, which is permanent as far as the members of a genus is concerned, assists in classification.

Returning to the *thecæ* (Greek, "a box") or spore-cases, sometimes called *sporangia* (a compound of two Greek words signifying "spore-vessel"), we must examine their structure more intimately. Each spore-case is somewhat globose, generally mounted upon a short stalk, and girt by an elastic ring (*annulus*). This ring may pass over the top of the spore-case (fig. 3), and in that case is *vertical*; or its direction may be *oblique* (fig. 4).

In some ferns the spore-cases are entirely destitute of a ring, and are termed *exannulate*. These generally split down the centre, and, as far as the British species are con-

cerned, form two valves (fig. 5). The interior of the spore-cases are filled, when mature, with the minute brown dust-like spores or seeds.

The development of ferns from spores is very curious, and differs considerably from the ordinary development of plants from seeds.

It is just because this process differs so much from our ordinary experience of growth in plants, that it will be difficult to explain satisfactorily, without the use of technicalities, how it takes place. Within a reasonable time after sowing the seeds, or spores, growth commences. Usually one or two seed-leaves are produced in common plants, such as mustard-seed sown for small salad. In the latter case the seed-leaves are very different in form



Fig. 3.



Fig. 4.

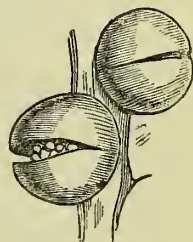


Fig. 5.

from the leaves which are produced afterwards by the same plant. But in ferns not only is the form different, but the function is also different. When the fern spores germinate, a kind of filmy green membrane is produced, which cannot be called a leaf: it lies flat upon the soil, adhering by means of delicate rootlets proceeding from its under surface, and when mature is lobed or almost heart-shaped. This delicate "false leaf" is technically named a *prothallus*. It is useless our attempting to give to this first leaf in ferns a name which is capable of being popularly understood, because the thing itself has no representative in ordinary experience. The use is not that of an ordinary leaf, the mode of growth and structure is not that of a leaf, and to call it "a leaf" would only con-

vey an erroneous notion. There is no alternative, then, but to call it a "prothallus," and, if the writer and the reader equally agree as to the meaning of the word, it will be just as easy to use the right one, as to coin one for the purpose. But, to return to this curious filmy "prothallus." When mature, two kind of organs are produced from its under surface, and these represent the male and female principle in the process of fertilization. One kind of organ contains the germ of the future plant, a kind of bud in its most rudimentary state: this we may term the germ-cell. The other organs represent the fertilizing principle, and may rudely be designated little bags or cells containing active little thread-like bodies (*spermatozoids*) which, when they are liberated from the cells which contained them, move about as though endowed with



Fig. 6.

animal life. (Fig. 6.) When the little bud or germ has reached a proper state of maturity, it protrudes from its cell and comes into contact with some of these mysterious little active thread-like bodies, and thus the bud is fertilized. Gradually the lively bodies become still and disappear, the bud increases in size, the green membrane, which is called the prothallus, disappears also, and nothing is left but the young bud, which begins to put on the appearance of a miniature fern plant, develops little leaves, and grows up in the likeness of the parent plant, from whence the spores or seeds were first taken.

This is merely a rough outline of the process which takes place in the growth of a young fern from spores. The terms which we have been compelled to use, in order

to render the description intelligible to those who may not possess a large amount of botanical knowledge, are perhaps not unexceptionable; but the student who really desires to pursue the subject further under a more scientific guise is recommended to consult Hofmeister's treatise on the "Germination, Development, and Fructification of the Higher Cryptogamia," of which a translation has been published by the Ray Society.



FROND OF A FERN.

HOW TO GROW FERNS.

No plants are so suitable for indoor or town culture as ferns, hence no others are so popular, and those who have not had much experience in their treatment will not object to a few hints on the subject. There are two methods in which ferns may be cultivated, viz., in an open fernery, or in closed cases; but before adverting to either, it may be advisable to give a hint or two on raising ferns from spores. The German gardeners take a cube of turfy peat, about $1\frac{1}{2}$ inch square, and this they dip in boiling water in order to destroy all the animal life which it contains; it is then laid in a flat saucer, and the spores are sprinkled upon the upper side. A small quantity of water is poured into the saucer, and the whole is covered with a bell-glass. A little water is required to be added from time to time, to compensate for evaporation, but great care must be taken to pour it in without washing the spores off the turf, and in five or six weeks a green moss-like substance will cover the turf, and the young ferns will gradually develope themselves.

Mrs. Helen Watney informs us that it is a curious fact that fern spores which have been gathered and dried three or four years, will, when sown, germinate more quickly than fresh spores.

Some persons employ a porous sandstone in the place of peat, and the lady to whom we have already alluded recommends cinders, for the following reasons: "Sandstone almost invariably contains the germs of fungi, which hinder, and very frequently prevent, the development of the fern spores, and peat, unless prepared by dipping in boiling water, and thus destroying all life, is open to the same objection. Now, if cinders (which, if fresh, contain no fungi) are used mixed with a suitable quantity of peat, subjected as above, the ferns will have a fair chance of

proper development, for it is highly improbable that fungi will obstruct their growth. I have found that peat, if used alone, becomes soddened ; and as ferns, like all other plants cultivated in pots, require good drainage, that essential is obtained by the use of cinders mixed therewith." Many gardeners raise their ferns by sowing the spores on silver sand. We have known of many successes from the employment of sandstone, and some failures through the prevalence of fungoid growths ; but of the admixture of cinders and peat, as above recommended, all the testimony has hitherto been favourable.

The cultivation of ferns in the open air demands but little special comment. A sloping bank, shaded from the direct rays of the sun, in a sheltered situation, and where possible in the neighbourhood of a pond, stream, or ornamental water, is the first object to be regarded. If these conditions cannot be fulfilled, the situation should, at the least, be damp and shady. It is customary to plant ferns in an artificial rockwork ; but, when this is done, the mound should *not* be so constructed that every drop of moisture is carefully drained away, but rather to be the face of a slope from higher ground, so that the drying winds do not whistle all around it, and extract every atom of water. If the spot is carefully selected, and a light soil provided for the interstices of the stone-work, there is very little to fear. The most luxuriant plants of the Royal Fern which we have ever seen under cultivation were placed amongst the rough stone-work of a large rustic fountain, and here they flourished apparently as well as in their native "homes and haunts." Many a window, in towns, from which the prospect is only a blank wall, might be made to look cheerful and comfortable by raising an outdoor fernery of the hardiest species around it. Under such conditions, a humble imitation might be made of the fernery windows on the ground floor of the South Kensington Museum.

Ferns may be grown in pots with great success. The common deep flower-pots are as good as any for the purpose, and it is as injurious to put in too many "crops"

for drainage as too few : moderation is best, and, as a rule, what would be considered good drainage for ordinary pot plants will answer very well for ferns. From whatever soil they may be taken, it is surprising how soon ferns will accommodate themselves to the loam and peat in which they are usually grown. The rock-loving species are best grown in a mixture of broken brickbats, old mortar, and sandy loam, taking care that they are not stinted of moisture in the summer, and but slightly moistened during the winter. Many species are very impatient of any moisture at their crowns, so that it is a good plan to keep the crowns elevated to the level, or a little above the level, of the pot. We have found that all the plants which required to be transferred to larger pots—an operation which becomes essential every two or three years—may be removed as well in the early spring as at any other season of the year, and much better than during the winter. A great deal is said and written about plenty of light and air, but too much of either is certainly a disadvantage in fern culture. At all times of the year, except about three months in the winter, we should certainly recommend shading them more or less, according to the strength of sunlight. Water is another point on which theory and practice often differ. Ferns will certainly never flourish in a dry powdery condition of the soil, nor will they continue to do so when it is permanently saturated with moisture. A moist atmosphere is better than all the syringing in the world : in fact, the continual squirting of water over the foliage and crowns of many ferns, except the hardiest, is simply dooming them to death. Rain-water in moderation, no direct glare of sunlight, gradual admission of air when the temperature is too high, and the careful destruction of small slugs and all similar pests, are the best rules to remember.

For the introduction of the method of growing plants in closed cases we are indebted to Mr. N. B. Ward, from whom such cases are generally denominated Wardian cases. There are two errors commonly entertained with regard to the growth of ferns in closed cases. One error

exists in the belief that the cases must be air-tight; and the other, that it is quite sufficient, at stated intervals, to let in upon them a deluge of water.

The form of the case may be accommodated to individual taste. Some prefer the octagonal, some the quadrangular. Let each consult his or her peculiar taste; and we will describe one to serve as a model either to imitate or shun, as taste may prompt, the object being rather to illustrate the principle of construction, &c., than to establish any orthodox standard.

First of all construct a strong wooden box, 30 inches in length, 17 inches in width, and 5 inches deep. Cover it well inside with pitch, and outside with paint. At one end, and on a level with the bottom, insert a small stop-cock or a wooden plug, so as to draw off, if necessary, any superfluous water. Lay on the bottom, to the depth of 1 inch, any drainage material. Then fill to the top with soil. Some will prefer sifted cocoa-nut refuse and charcoal, others a mixture of fibrous peat and sand, whilst others will be content with a light loam. In this the ferns may be planted, according to taste. The upper portion, which consists of a zinc framework glazed, may rest upon a ledge, half an inch below the level of the top in the interior of the wooden box. Or if the case is smaller than the above dimensions, and the top not too heavy, it may rest on the soil, leaving a space of half an inch all round between the box and the cover: by this means the external air passes and is filtered through the soil before it enters the case. Whatever may be the form of the upper portion of the case, it is always advisable to have at each end, at the top, a strip of perforated zinc, about an inch in depth, and extending across the case. This should be furnished with a shutter inside, so contrived that it may be opened or closed at will. This arrangement will obviate the cloudy appearance of the glass, which in perfectly closed cases often prevents the contents being seen, and will, moreover, be advantageous to the ferns. As the consumption of water is small, such a case *seldom* will require its addition, and *never* improve under a deluge.

Any excess of water which may have been supplied may be drawn off by the plug or stopcock at the end.

Planting the case may next occupy attention; and this may be done either by inserting potted ferns, and covering the pots with the soil, or employing only cocoa-nut refuse for the purpose; or the ferns may be transplanted directly into the soil. Special precautions must be taken with species having creeping rhizomes, which must be provided with little elevations on which to be planted.

The selection of species must depend greatly on the localization of the fernery when completed. If it is to be placed in a room in which a fire is constantly kept during the winter, more tender species may be cultivated than if the case is intended to take its chance in some room whence fires are generally excluded. Many foreign species may be added with advantage to those which are natives of this country, half of which, at the least, are too large for any moderate-sized fernery. After the enumeration of British species contained in this work, a brief account is appended of some of the hardy species in cultivation, from which a selection may be made.

In placing this fernery, when completed, the full glare of sunlight should be studiously avoided: a northern aspect is good, north-western is perhaps the best. When travelling through North Wales in search of ferns, we ascertained the aspect of a great number of flourishing fern patches by means of a pocket compass, and found invariably that it was north-west; a fact which we have taken care to remember.

It is by no means essential that an elaborate fern-case should be constructed at a great expense to cultivate a few ferns. For a few shillings a very respectable cottage fernery may be established. Two or three ferns may be planted in a common flower-pan, which is naturally porous, not being glazed either inside or out. This may be placed in a round earthenware dish, with the space of an inch all around between the outside of the pan and the inside of the dish. This intervening space may be filled with bog moss (*Sphagnum*), and a bell-glass over all, or only over

the inner pan. The common hand-glass, with a greenish tint, are preferable to those which are colourless, and whose sole recommendation lies in their higher price. A hole may be drilled with advantage through the handle at the top of the glass, for ventilation. A piece of soft wood will easily stop it if desired. When water is added, it should be poured over the bog moss in the outer circle only, enough moisture will then find its way through the porous sides of the inner pan; and a very convenient and economical little fernery, wanting scarcely any attention, will be the result.

Of the species hereafter enumerated the following are suitable for cultivation in closed cases :

- The Beech Fern (*Polypodium phegopteris*).
- The Oak Fern (*Polypodium dryopteris*).
- The Parsley Fern (*Allosorus crispus*).
- * The Holly Fern (*Polystichum lonchitis*).
- The Wall Rue (*Asplenium ruta-muraria*).
- The Green Spleenwort (*Asplenium viride*).
- The Wall Spleenwort (*Asplenium trichomanes*).
- The Sea Spleenwort (*Asplenium marinum*).
- The Rock Spleenwort (*Asplenium fontanum*).
- The Bristly Spleenwort (*Asplenium lanceolatum*).
- The Maidenhair Spleenwort (*Asplenium adiantum-nigrum*).
- * The Hart's Tongue (*Scolopendrium vulgare*).
- * The Hard Fern (*Blechnum spicant*).
- The Maidenhair (*Adiantum capillus-veneris*).
- The Alpine Woodsia (*Woodsia hyperborea*).
- The Hairy Woodsia (*Woodsia ilvensis*).

Under special conditions in a separate case:—

- The Tunbridge Fern (*Hymenophyllum Tunbridgense*).
- The Wilson's Fern (*Hymenophyllum unilaterale*).
- The Killarney Fern (*Trichomanes radicans*).

Those to which a * is prefixed are too large for a small fern-case.

PESTS AND PARASITES.

Ferns, like other plants, have their enemies; and these come chiefly under two forms: the creatures which make a meal of the young fronds, and the fungi which vegetate upon them. Juvenile slugs are great foes to young ferns. Just as the young fronds begin to unroll, they are liable to be nibbled off, or, if expanded, the fresh green leaflets are often doomed to destruction. The specific recommended to children for small birds is much more successful with slugs, *i. e.*, to "put salt on their tails." As it is impossible to catch all the depredators in the act, so as to inflict summary "salting" upon them, it is advisable when they have once been discovered at their tricks, to look well after them for the future, to turn up the old fronds, and search neighbouring plants, in fact, every likely spot. It has been recommended that anything which is calculated to annoy or prevent their passing over the soil should be tried, such as horsehair cut into small pieces, and even the sprinkling of salt in the neighbourhood, especially in dry weather; but for the cure of slugs, as well as the diseases of mortal man, specifics often fail.

The *larvæ* of Lepidopterous insects, better known as "caterpillars," sometimes make war upon ferns. A lady at Cheltenham had an open-air fernery which was subject to the incursions of the caterpillar of the great tiger moth.* They were first found on the Lady Ferns. A few days after having caught the first spoilers, she went to look at her ferns again, and to her consternation, the Lady Ferns, which had been looking lovely only a week before, were completely eaten bare to the mid-rib, scarcely a bit of the soft part of the fronds remained, and on the little that was left the "woolly bears" were sedulously at work. She then observed some fine specimens of the Male Fern had

* *Arctia caja.*

been attacked and half demolished, also some other of the Boss Ferns, especially the Crisped Boss Fern and the Broad Boss Fern, the latter the last to be attacked. They also commenced on the Royal Ferns, and had entirely destroyed one or two fronds before they were observed. Morning by morning the lady and her servant went and took sometimes from twenty-five to thirty off one plant. When the Lady Ferns, Boss Ferns, and Royal Ferns fail, the depredators would prey upon the Shield Ferns, but only when they could get nothing more tender.

Woodlice and kindred crustacea are also sometimes great pests among ferns. The surest way of checking their marauding expeditions is to offer them something which they like better. If, for instance, potatoes are cut in half, and a portion scooped out from the centre of the flat side, and these cups are inverted in localities frequented by the woodlice, they will collect in the cavity, and whenever the potatoes are examined a goodly number may be secured. Carrots have also been recommended as equally efficacious.

Vegetable parasites are not much annoyance to the cultivator, since they chiefly confine themselves to plants in the uncultivated state, or when the fronds are dead. Moulds occasionally appear on the young ferns grown from spores, but these generally proceed from the soil or peat on which the seeds have been sown. The Brittle Bladder Fern is subject to have the under surface of the fronds sprinkled with orange-coloured patches, caused by an orange powder which bursts through the cuticle. This is a parasitic fungus,* and the orange powder its seeds or spores. Although only found on this fern in Britain, it has been detected on other species abroad.

The under surface of the fronds of the common Bracken sometimes present a curious appearance from short parallel black lines, which at first resemble clusters of spore-cases in their arrangement, but differing in colour as well as position, for the parallel lines of spore-cases observed

* *Uredo filicum*.

in the Spleenworts do not occur on the Bracken. These black lines (fig. 9) are found on the green fronds at the same time as the fructification, and belong also to a parasitic fungus,* only recently recorded in Great Britain. The black lines contain several cells, and in these cells numerous transparent long sacs, each containing eight elongated spores or seeds. (Fig. 7.)



Fig. 7.

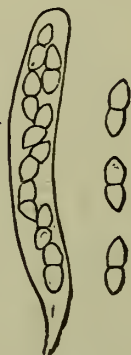


Fig. 8.

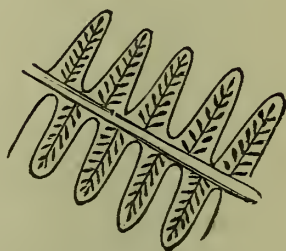


Fig. 9.

When the old fronds of the Bracken have lain on the ground through the winter, another fungus† makes its appearance in little shining black points, not much larger than the point of a pin, scattered over the surface. Each of these points is a small globose black cell containing similar long transparent sacs to the last named, but with spores or seeds of a different form. (Fig. 8.)

Not only the fronds, but the stalks also, of the Bracken become the home of a parasite of a similar character. It is not uncommon to observe on these old stalks long black marks, sometimes less than an inch, but often two or three inches in length, and several of them together. These marks are slightly raised above the rest of the stem, and contain the cells, elongated sacs, and spores or seeds of another fungus‡ similar to that on the fronds. (Fig. 10.)

Very recently Dr. E. Capron, of Shere, has detected one or two other parasites of a similar nature on dead Bracken stems, not before noticed in this country.

* *Dothidea filicina*.† *Sphærella Pteridis*.‡ *Dothidea Pteridis*.

It is scarcely necessary to name all the parasitic fungi which are found on ferns, or even all those known to have been seen in Great Britain. There are, however, two or three others to which we will briefly allude.

The dead stems of the Bracken sometimes bear a number of little waxy clubs, which are white and pellucid, scarcely exceeding a quarter of an inch in length. These clubs are a species of fungus,* of a very different order to those already named.

A prettier object for the microscope is much more common on Bracken stems lying upon the ground. This consists of little cups, no larger than a small pin's head, a minute *Peziza* which we first found at Darenth Wood, and have since seen in other localities. Hitherto it has not been recorded to be found in Great Britain, though it has long been known in France.

There is also a little creature which deserves to be mentioned, and which is a great pest to ferns and other plants when dried for the herbarium. This is the little *Atropos*, one of the insects known as the "death-watch," from the peculiar ticking noise which it is said to cause. Whether or not this little insect is capable of making the noise attributed to it is considered by many entomologists as doubtful. No one has ever doubted its being a little nuisance when it establishes itself amongst dried plants.

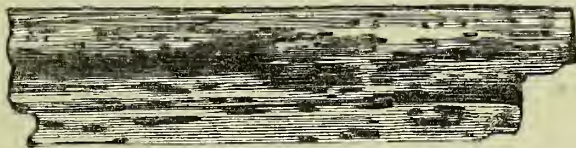


Fig. 10.

* *Pistillaria puberula*.

HOW TO FORM A HERBARIUM.

The collection of ferns for transplanting, and the collection of fronds for preservation as botanical specimens, are to be pursued at very different periods of the year; and as the former has already been alluded to, it is to the latter that we are desirous of devoting a few pages. It may be premised that for botanical purposes fronds destitute of fructification are worse than useless unless they belong to species which produce distinct fertile and barren fronds, and in which the characters and appearance of these fronds materially differ. In such cases the two kinds of fronds should be collected and preserved together.

The period for collecting ferns for the herbarium is therefore manifestly that when the fructification has nearly attained to maturity, and it is always better to collect them on a dry day than on a very wet one. The collector should go out prepared for collecting ferns, if he desires that his herbarium should present a neat and respectable appearance when completed. Some recommend a vasculum, some a bag, and some a large book under the arm; but commend us to two half-inch deal boards, about 11 inches by 17, with a strap and buckle for each end, and twenty sheets of good bibulous paper, cut to the same size, and placed between them. Having selected a good frond or two for preservation, taking care not to break the stipe or stalk, but to separate it from the rhizome or root-stock, bend back the stipe just below the lowest leaflets of the frond, breaking the woody portion, but not dividing it from the rest of the frond, and lay it carefully between a sheet of your bibulous paper, and secure it with the spare paper between your boards; then proceed in search of more. Fronds, which with their stalks are not too long for the paper, should be laid in without bending.

In selecting fronds for preservation, it is not the largest that are required, but it is rather advisable to collect

such specimens as will lie comfortably between the papers without bending, than to aim at procuring *fine* specimens which may only prove to be a nuisance. A perfect frond of 9 inches in length is better than a folded or otherwise mutilated one of 19 inches. In selecting fronds, the fruit should not be too ripe, or instead of spores you will only find empty cases, not to mention the rusty dust that will continually tint your papers. It is better that the spores should be scarcely matured. Then, again, it should be noticed whether the frond is eaten by insects, broken, or in any other way imperfect. Such specimens are to be avoided if others can be obtained. Finally, the specimen selected should be well grown, and not distorted, unsymmetrical, or exhibit a tendency to sporting or departure from the general type of the neighbouring fronds.

Having collected what specimens are required and conveyed them home, the next process consists of drying them for the herbarium. This is accomplished by removing them from the papers in which they have been collected, and transferring them to fresh paper. Some persons are content with a stout unsized paper, such as employed by grocers for wrapping sugar, others will proceed to blotting paper, whilst the majority will admit that Bentall's botanical paper is decidedly the best. The ferns should be transferred to a sheet of drying paper; two or three thicknesses, or even four or five, may be placed upon it, and then another specimen, and thus *ad libitum*. When all are in this manner transferred, the pile should be placed in a press, or with a stout board above and below, loaded on the top with some heavy weights, stones, bricks, old books, or anything applicable for the purpose. Twenty-four hours at the least, and forty-eight at the most, they should remain unmoved. At the expiration of this period each specimen should be transferred to a dry sheet of paper, with three or four thicknesses of dry paper between each specimen, and again put under pressure for the same period. The damp paper from which the specimens are taken should be at once dried in the sun or before the fire. It is always advisable to change the

papers in which specimens are being dried at least four times during the first week ; some persons change them daily. After the first week, if placed between the folds of a fresh dry sheet of paper once a week, and kept under a moderate pressure for a month, the drying process may be considered complete. No specimen should be transferred to the herbarium in less than a month from the time of its being collected.

There is one small caution which must not be forgotten. A specimen should never be put under pressure to be dried without being accompanied by a small scrap of paper, on which is written the *locality* where the specimen was collected, and the *date* of collection. A name can be added at any time, since the specimen itself will furnish the data from whence this may be determined ; but it will be impossible to furnish localities and dates with any precision at a future occasion, and upon the accuracy of these much of the value of the specimen will depend.

Before the specimen is permanently transferred to the herbarium, it should be *poisoned*, to prevent its injury or destruction by mites and other predacious little pests. A small quantity of finely powdered corrosive sublimate—about as much as will lay on a fourpenny piece is sufficient—should be put into a bottle containing 4 oz. of spirits of wine, and permitted to stand for a day or two, shaking the bottle occasionally in the interim. With a small brush this solution should be brushed all over each specimen on both surfaces, and then, when thoroughly dried, it may take its proper place in the herbarium.

Opinions may vary as to many of the minor details of a herbarium ; but, at the risk of not pleasing every one, we will present a scheme for the construction and maintenance of a herbarium of British ferns.

The paper on which the specimens are to be mounted should not be too thin : a good cartridge paper will answer every purpose. The standard herbarium size is about 18 by 11 inches. This is as large as any one could desire. Each *species*, at least, should have the whole of a sheet devoted to it. The larger ferns will require a separate

sheet for each *variety*. The specimens should be laid on the paper with the under or fructifying surface uppermost, and the barren side of the frond applied to the paper. Small strips of gummed paper, about an inch in length, and not more than one-eighth of an inch in width, should be laid across the principal and secondary ribs or branches of the frond, and each end fastened down to the sheet of paper; other pieces may, in like manner, be placed across the tips of the fronds, or wherever else appears to be necessary to secure the specimen to the paper. It may be suggested that too many such slips disfigure the specimen, and if there are not sufficient it cannot be retained in its place. Experience must be the best teacher. Some object to fastening the specimens to paper at all, others recommend gluing them down by the whole surface. Both these plans appear to us to be equally objectionable. If the specimens are loose, they are not only in danger of being broken or damaged, but of being misplaced and dissevered from the label which belongs to them. If wholly glued down they cannot under many circumstances be removed from the paper, either to be transferred to other paper, or for closer examination or comparison.

Each specimen having been mounted, the label which accompanies it should be fastened down beside it. This may be pasted. Finally, its generic and specific name should be written legibly at the lower *right*-hand corner. All the specimens belonging to one genus should then be collected together, and placed between the folds of a sheet of paper half an inch wider and longer, when folded, than the half-sheets upon which the specimens are mounted. These "genera covers" may be of the same paper, or a smooth brown paper may be employed for the purpose. On the outside of the "genera covers," at the lower *left*-hand corner, the name of the genus should be written in a good bold hand. The whole may be transferred to a deal box, the front of which is movable as well as the lid, being hinged to the bottom, so as to fall down and lie flat on the table. The lid may be so contrived as to hold the front in its place when closed. A deal box 9 inches deep,

13 inches wide, and 20 inches long will hold a good collection, and if this ever should prove too small for the number of specimens obtained, a second box of the same dimensions will remedy the evil. The order of succession in which the genera are placed in the box may be taken from this volume, which will then serve as an index to the herbarium.

If it is considered desirable, a little camphor may be kept with the specimens, but the best preservative will be to look them all over, and thus allow the air to have access to them, once in every six months. With such precautions a collection may be preserved uninjured for years, provided always that it is kept in a *dry* place—not moderately, but *thoroughly* dry—or “mould” may injure irremediably what insects have spared.

A neat little collection of ferns, of smaller pretensions, and less claims to be regarded in a scientific light, may be arranged in a kind of album or scrap-book, with “guards” introduced by the binder sufficient to compensate for the extra thickness caused by the insertion of the specimens. A tinted paper is often used in the manufacture of these books, which the good taste of a lady may transform into a very interesting volume for the drawing-room table.



CLASSIFICATION.

Before proceeding with the enumeration of species, it will much facilitate the process if we will take a little trouble to understand what are the prominent features of the groups, called *genera*, under which the species are classed. The enumeration of these characters here will also prevent the necessity of recurring to them hereafter, and, being brought together in one chapter, rendered more easy of comparison when it is desired to determine to what genus any unknown specimen may belong.

The ferns which we shall have to describe may in the first instance be divided into two primary groups, each containing several genera. The distinguishing feature in this separation will be that in one group the *thecæ*, or spore-cases, are not surrounded by any *annulus* or *ring*, which is much the smallest group, and includes but three genera, and which may be named *exannulate*, or "without a ring." The other and larger group has spore-cases *always* surrounded or girt by a ring, and this we shall call *annulate*, or "with a ring."

First of all, we will examine the small group which we have called

EXANNULATE (*without a ring*).

As already observed, only three genera constitute this group, of which two have the spore-cases borne on a special frond, and in the other the spore-cases are borne on the changed upper portion of an otherwise barren frond. In this group it will be observed that the *thecæ* or spore-cases are *not* borne in clusters on the backs or margins of unaltered, or but little altered, fronds, but are confined to a special portion of the plant, in which the whole surface so set apart is devoted to its spore-bearing office. The spore-cases are themselves globose, splitting across the centre into two valves, to permit the spores to escape.

The principal features which may be employed to distinguish the three genera which compose this group are—

The spore-cases are arranged on a simple and unbranched spike in ADDERS' TONGUES (*Ophioglossum*).

The spore-cases are arranged on a compound or branched spike in MOONWORTS (*Botrychium*).

The spore-cases are clustered upon the branched or metamorphosed upper portion of an otherwise barren frond in OSMUND FERNS (*Osmunda*).



Fig. 11.

The general character of the spore-cases in this group are represented in figs. 5 and 11.

The second and larger group contains all the genera which are

ANNULATE (*with a ring*).

That we may render our analysis of this group evident to those who are not professedly scientific, it will be necessary to resort to a further subdivision into minor groups.

If the spore-cases of all the species could be examined in succession, it would be observed that in a few of them the ring is *oblique*, whilst in the majority of them the ring is *vertical*. Thus we are enabled to remove the sub-group with oblique rings for future consideration, and, for the present, deal only with those genera in which the ring is *vertical*.

As the sub-group still reserved is a large one, it will be essential to find some other character which is common to a few of the genera, and not present in the others. If we look at the clusters of spore-cases, which we have already observed are called *sori*, and which are arranged on the back or at the margins of the fronds, it will be observed that in some instances the tufts are quite naked,

whilst in others they are covered with, or surrounded by, a membrane of variable form. This enables us to constitute two sections of our sub-group, in which—

SECTION I.—The tufts of spore-cases are naked ;

SECTION II.—The tufts of spore-cases are covered (*indusiate*).

The *first* section, with naked tufts, contains three genera, which may be distinguished by the following characters :

The clusters are circular, and the margin of the frond is flat (not reflexed), in the POLYPODIES (*Polypodium*).

The clusters are at first circular, afterwards spreading one to the other, and becoming confluent, the margin of the frond bent back (reflexed), in the PARSLEY FERN (*Allosorus*).

The clusters are elongated, or linear, in the JERSEY FERN (*Gymnogramma*).



Fig 12.



Fig. 13.

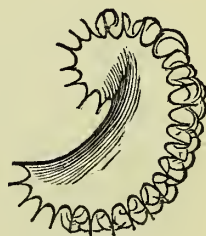


Fig. 14.

By attention to the above characters, it will be easy to refer any fern with naked *sori* which is a native of Great Britain, to its proper genus.

The *second* section, with covered or *indusiate* tufts, or clusters of spore-cases, contain eleven genera, so that it will be necessary to separate those with true or evident coverings, from those in which the covering is imperfect. If, with this limitation, we examine the seven genera in which the clusters are truly and manifestly covered, we shall find that in two of these the clusters are *circular*, in four of them the clusters are *elongated*, and in the seventh they form a continuous line down the frond. Thus we may state their characters :

Clusters circular.—Covering kidney-shaped in the BOSS FERNS (*Lastrea*). (Fig. 12.)

Covering circular in the SHIELD FERNS (*Polystichum*). (Fig. 13.)

Clusters oblong or linear.—Covering oblong, kidney-shaped, and fringed at the outer margin, LADY FERN (*Athyrium*). (Fig. 14.)

Covering straight in SPLEENWORTS (*Asplenium*). (Fig. 15.)

Clusters in pairs.—Covering opening down the centre between the twin clusters in HART'S TONGUE (*Scolopendrium*). (Fig. 16.)

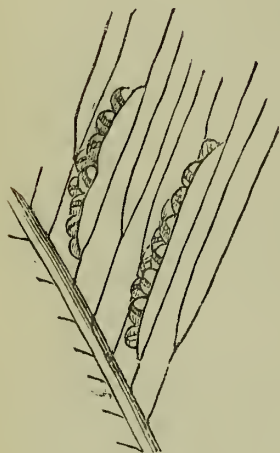


Fig. 15.

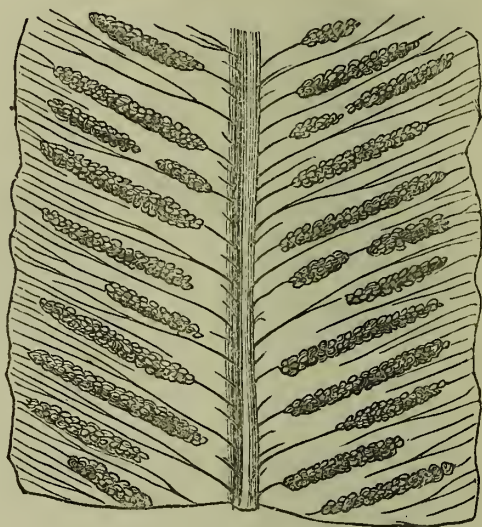


Fig. 16.

Spore-cases concealed amongst brown chaffy scales, in the SCALE FERN (*Ceterach*).

Finally, the clusters of spore-cases form a continuous line along the back of the frond between the mid-rib and the margin, with a linear covering, in the HARD FERN (*Blechnum*). (Fig. 17.)

It will be observed that in all the above seven genera, in which there is a true covering, the fructification is *dorsal*; that is, it is borne on the back of the frond. In

the four following genera, in which the covering is imperfect, the fructification is *marginal*, that is, it is borne along the edges of the fronds. In two of these the cover is formed by the bending back of the margin of the frond.

The whole margin rolled back forms a covering in the BRACKEN (*Pteris*). (Fig. 18.)

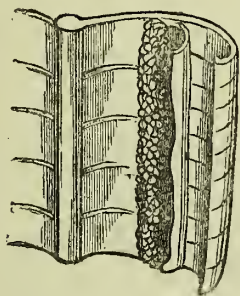


Fig. 17.

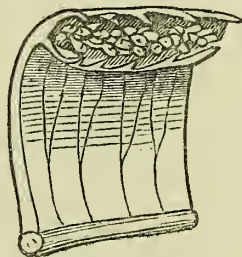


Fig. 18.

Lobes of the margin folded back forms the covering in the MAIDENHAIR (*Adiantum*). (Fig. 1.)

In the remaining two genera, having an imperfect or modified covering, one of these has a kind of special *indusium* attached behind, and covering the spore-cases as if with a hood, in BLADDER FERNS (*Cystopteris*). (Fig. 19.)



Fig. 19.



Fig. 20.

The other has a roundish, somewhat cup-shaped receptacle, with fringed margins (*Woodsia*). (Fig. 20.)

Thus far we have given the prominent characters of all the genera of British ferns in which the spore-cases are surrounded by a vertical ring. It has already been observed that there remains a small group, consisting only of two genera, in which the ring is oblique, and these are

still further characterized by the thin membranaceous texture of the fronds. In this group the tufts of spore-cases are enclosed in a kind of receptacle.

This receptacle is urn-shaped in the BRISTLE FERNS (*Trichomanes*). (Fig. 21.)

The receptacle is two-valved in the FILMY FERNS (*Hymenophyllum*). (Fig. 22.)

In order to affix these characters more permanently on the memory, they are tabulated in the following manner :*

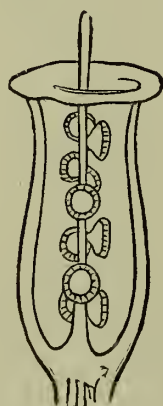


Fig. 21.



Fig. 22.

FIRST GROUP.—The spore-cases *without* a ring.

Spore-cases or seed-vessels borne on a separate

frond, in a simple spike . . . *Adder's Tongue.*

In a branched spike . . . *Moonwort.*

Spore-cases or seed-vessels borne on the upper part of a barren frond, which is branched—*Osmunda Ferns.*

SECOND GROUP.—The spore-cases surrounded by a ring.

In the following the ring is vertical :

*The young botanist must bear in mind that many of the terms employed here are not rigidly and scientifically correct, but are the nearest approximation which popular language permits.

Spore-cases naked.

Spore-tufts circular and distinct . . .	<i>Polypodies.</i>
Spore-tufts running together . . .	<i>Parsley Fern.</i>
Spore-tufts elongated	<i>Jersey Fern.</i>

Spore-cases covered.

With a proper cover :

Spore-cover kidney-shaped, attached at the edge,
Boss Ferns.

Spore-cover circular, attached at the centre,
Shield Ferns.

Spore-cover kidney-shaped and fringed, *Lady Fern.*

Spore-cover straight, opening towards the mid-rib,
Spleenworts.

Elongated tufts of spore-cases in pairs, side by side,
covers opening down the middle—*Hart's Tongue.*

Tufts of spore-cases concealed amongst brown scales,
Scale Fern.

Tufts of spore-cases arranged in a long line,
Hard Fern

With a false or imperfect cover :—

Formed from the reflexed edge of the frond,
Bracken.

Formed from reflexed lobes of the frond,
Maidenhair.

Spore-cover forming a hood *Bladder Ferns.*

Spore-cover cup-shaped and fringed . . . *Woodsia.*

In the following the ring is oblique :

Spore-cases contained in a cup-shaped receptacle,
Filmy Ferns.

Spore-cases contained in a two-valved receptacle,
Bristle Ferns.

ADDER'S TONGUES.

The spore-cases arranged on a simple unbranched spike.

The Adder's Tongues, Moonworts, and Osmunds are classed by botanists in a different natural order from all the other species which we shall enumerate, on account of the spore-cases not being surrounded by an elastic ring. The Adder's Tongues are called *Ophioglossum*, from two Greek words having that meaning. They have a very different habit of growth to other British ferns, and the novice would at first be disposed to doubt their being ferns at all. An upright stalk, with a somewhat club-shaped top, bears the spore-cases, whilst a single leaf is attached to the side of the stem, and in some instances one or more similar leaves proceed from the root-stock. The Adder's Tongues differ from Moonwort and the Royal Fern in the spike of spore-cases being unbranched and the leaves undivided.

There are only two British species, which differ considerably in size, and this character will be sufficient for our present purpose to distinguish them. Moreover, the lesser Adder's Tongue is only found in the Channel Islands.

COMMON ADDER'S TONGUE, 6 to 12 inches high.

LESSER ADDER'S TONGUE, 2 to 4 inches high.

ADDER'S TONGUE.*

The Adder's Tongue produces annually, from a few coarse root fibres, an erect stem of from 6 to 12 inches in height, terminated by a club-shaped head, in which the spore-cases are imbedded in two opposite rows, one on each side of the spike. When mature, the spore-cases split across the centre, and discharge the enclosed spores. From the side of the erect stipe or stem a barren frond is borne. This barren frond is leaf-like, sheathing the stem

* *Ophioglossum vulgatum*, L.

in its lower portion, and expanding upwards into a more or less obtusely ovate or egg-shaped form. (Plate I., fig. 3.)

The localities in which this fern delights are damp meadows and loamy pastures, having a greater preference to moisture than the Moonwort, which affects dry and well-drained pastures and moors. The Adder's Tongue is the more common fern of the two, and is generally distributed over Europe. It is often abundant in localities where it occurs, but should not be sought after later than the month of June, at which season it is in perfection. The fertile spike is occasionally double, or forked, with a spike terminating each branch. This is the only variation to which it appears to be addicted.

The virtues of Adder's Tongue, as expounded by Gerard and the old herbalists, are undoubtedly fabulous. "The leaves of the adder's tongue," he writes, "stamped in a stone mortar, and boiled in oyle of olive, and then strained, will yield a most excellent green oyle, or rather a balsam, for greene wounds, comparable to oyle of St. John's wort, if it doth not far surpass it." It is said that the plant is still collected in some of the southern counties for the preparation of the "green oil of charity" extolled by old writers.

Culpepper informs us that "it is an herb under the dominion of the moon and Cancer; and therefore if the weakness of the retentive faculty be caused by an evil influence of Saturn, in any part of the body governed by the moon, or under the dominion of Cancer, this herb cures it by sympathy. It cures the diseases after specified, in any part of the body under the influence of Saturn, by antipathy."

Drayton ascribes the power of acting as an antidote to the poison of reptiles to this plant, in the following lines:

"For them that are with newts, or snakes, or adders stung,
He seeketh out an herb that's called adder's tongue;
As Nature it ordained, its own like hurt to cure,
And, sportive, did herself to niceties inure."

Apart from all fable or romance, this is an interesting fern, not only on account of its singular appearance,

which somewhat resembles the "tway blade" at a casual glance, but from its being the type of an order poorly represented in this country, so far as the numbers of species are concerned. It is so little like all our other ferns, except its little companion and the Moonwort and Royal Fern, that it would puzzle a young botanist, who had only seen such ferns as the Male Fern and the Spleenworts, to say whether it were a fern or not.

The cultivation of this plant, either in pots or the outdoor fernery, is by no means difficult. It requires a loamy or sandy peat soil, and should be removed before fructification, with plenty of soil attached, so as not to disturb the roots; and that "it loveth moisture" should not be forgotten.

LITTLE ADDER'S TONGUE.*

This little fern is by some botanists considered only as a small, stunted variety of the common Adder's Tongue.



modified by the circumstances under which it vegetates. Others consider it to be entitled to the rank of a species, from the different form of the barren frond, the occasional occurrence of a barren radical frond, the different form of the fertile spike and some other minor peculiarities. It does not often exceed 3 inches in height, with an erect stem or stipe bearing at its apex about six spore cases imbedded in the margin at each side, and forming a kind of spindle shaped head, which is narrowed downwards and upwards so as to terminate in a blunt point. From one side of this stipe a barren frond is produced, which is rather fleshy and of narrow lanceolate shape. An additional barren frond

* *Ophioglossum lusitanicum*, L.

occasionally rises from the rhizome or root-stock, of a similar form, narrowed downwards into a sort of peduncle or stalk.

This curious little Adder's Tongue has been found in Guernsey, and is in perfection during the month of February. Mr. Sowerby received a specimen which was said to have been collected in Cornwall, but the precise locality was not indicated. It is not at all improbable that it may be found in the southern counties of England, as its small form and early fructification may have hitherto eluded discovery.

THE MOONWORTS.

Spore-cases arranged on a compound or branched spike.

As we have but one British species of Moonwort, there is but little occasion to refer separately to the characters which are considered generic and those which are only of specific value. The name of the genus, *Botrychium*, is derived from the Greek word for a "little bunch of grapes," in allusion to the manner in which the spore-cases are arranged. As already observed, the Moonwort differs from Adder's Tongues in the spike which bears the spore-cases being branched, and from the Royal Fern in the whole fertile spike bearing the spore-cases; whereas in the Osmund the lower portion of the frond, which bears the spore-cases, still retains its leafy character, and remains barren. There are other species of Moonwort in other parts of the globe, although only one species inhabits the British Islands; as, for instance, in North America, the Sandwich Islands, Japan, India, Ceylon, and New Zealand.

MOONWORT.*

The Moonwort is a little plant, easily distinguished, when found, by the fertile upper portion forming a com-

* *Botrychium lunaria*, Sw.

pound spike, and the barren lower portion resembling a single pinnate leaf attached to the side of a stem. Before expanding, this leafy portion is not rolled spirally, as in many ferns, but the two flat surfaces of the two sides of the frond are applied together face to face. When expanded and mature, the whole plant seldom exceeds 6 or 8 inches in height, and often not more than 3 or 4. The barren frond—for it seems entitled to that designation—is pinnate, or divided on each side into a series of fan-shaped lobes, which are opposite to each other in pairs, of which from four to seven pairs occur upon a frond. Sometimes the lobes are almost crescent-shaped, and but slightly notched on the margin; at other times they are nearer fan-shaped with the margin, and more irregular. The fertile frond is erect and branched, with the globose sessile spore-cases clustered on the branchlets. These cases consist of two concave valves, which open transversely when the spores are mature. (Plate I., fig. 2.)

This species is local rather than rare, it being found in open heaths, moors and commons, and elevated rocky pastures.

In olden times mysterious and extraordinary properties were ascribed to the Moonwort. Chaucer names it as part of the alchemist's furniture:

“And herbes coude I tell eke many on,
As egremonie, valerian, and lunarie.”

And for this reason, as old authors tell, “it hath beene used among the alchymistes and witches to doe wonders withall, who say, that it will loose lockes, and make them to fall from the feet of horses that graze where it doth grow, and hath beene called *Martagon*, whereas they are all but drowsie dreames and illusions.” Referring to this belief, Withers wrote:

“There is an herb, some say, whose virtue's such,
It in the pasture, only with a touch,
Unshods the new-shod steed.”

In those days, when witches were supposed to ride on broomsticks, it is said that this little fern served the

purpose of a saddle for the steed. The Ettrick Shepherd embodies this superstition thus :

“The first leet night, quhan the new moon set,
Quhan all was douffe and mirk,
We saddled our naigis wi’ the moon-fern leif,
And rode fra Kilmenin Kirk.

“Some horses were of the brume-cow framit,
And some of the greine bay tree;
But mine was made of ane humlocke schaw,
And a stout stallion was he.”

It must have been but a small saddle that the leaf of this fern could furnish ; but, as there is no accounting for taste, so there is no accounting for witches, or their freaks and fancies.

It has always surprised us to read “Of all ferns this is one of the most easy to cultivate,” since by almost common consent, except the author above quoted, it is regarded as anything but easy of cultivation. We have carefully collected twenty or thirty plants in the mountain pastures of Wales, with plenty of soil about them, and planted them in fern-cases, in the garden, and under various conditions, and hailed their appearance a second year, but never a third. Yet we believe that it may be possible for others to succeed better than ourselves, notwithstanding that we have found the experience of friends to be an exact counterpart of our own. It has been recommended by some to dig the plants with plenty of turf about them, not disturbing the roots, and planting in an exposed situation, where water cannot become stagnant around them ; others recommend planting “in a sandy and fibry loam, or sandy, but not spongy, peat ;” and others, transplanting when just starting growth (not a very easy time, by-the-bye, to find them amongst the grass of pastures), into peaty or loamy soil in pots, and keeping them in a cold frame.

An incidental testimony is afforded that this is *not* one of the most easy ferns to cultivate, in the fact that we hear of no cultivated varieties. Two or three varieties have been mentioned as having been found wild, differing chiefly in the form of the lobes of the barren frond. One of these, found by Bolton near Halifax, had the lobes fan-

shaped, and cleft nearly to the base in four or five segments.

THE OSMUND FERNS.

Spore-cases clustered upon the branched and contracted upper portion of an otherwise barren frond.

The name of *Osmunda*, given to this genus of ferns by botanists, is said to have had its origin in a romance, having for its hero "the waterman Osmund of Loch Tyne," who hid his family from the Danes in an island covered with the Royal Fern.

Technically, these ferns differ from the Moonworts in their mode of development, for the young fronds unfold in a spiral manner, as in the majority of ferns; also in the branched clusters of spore-cases forming the upper portion of an otherwise leafy frond.

These ferns are only represented in the British Isles by one species. Several other species occur in North America and other parts of the world. Because we have only one Moonwort, and one kind of Osmund Fern, it must not be supposed that there are no others. There are people in the world who are apt to forget this, and, jumping to hasty conclusions, condemn the botanist for keeping a separate genus of ferns for one Moonwort, and one Osmund, and one Jersey Fern, and one Killarney Fern, as if these insignificant little islands were the whole world, and contained all the ferns that are in existence.

ROYAL FERN.*

This kingly fern is the most majestic of British species, and to say that it is well deserving of its name is only to repeat what every one has affirmed who has written on the subject. We have seen it growing luxuriantly, so that a tall man with his hat on was completely obscured when walking amongst it, and one on horseback could only comfortably overlook the little forest. Commonly

* *Osmunda regalis*, L.

the entire height of the plant does not exceed 4 or 5 feet, but it sometimes reaches from 8 to 10 feet. Mr. Andrews remarked, at a meeting of the Natural History Society of Dublin, that he had seen specimens 11 feet high growing round the margins of the islands, which were of limestone formation, opposite Muckcross, Killarney. The root-stock or rhizome lengthens year by year as the terminal fronds decay, so that a kind of stem is at length formed of from 10 to 18 inches in height. The fronds are always produced from the crown of this root-stock, growing in the spring and decaying in the autumn, so that in winter only the naked stumps are to be seen. The general outline of the fronds is lanceolate, bearing several pairs of oppositely diverging *pinnæ*; or—what we may be pardoned for saying—resemble opposite pairs of pinnate leaves, with leaflets all along on each side of the axis, and one at the end. These leaflets, or, to write more correctly, *pinnules*, are nearly sessile and oblong, with an indefinite ear-like lobe at the base, blunt at the tips, and serrated or bluntly toothed along the margin. Some of these fronds always remain barren; in fact, only a few of them are fertile. Those privileged fronds which bear the fruit have the upper portion metamorphosed. The *pinnæ* are shortened and contracted at first, appearing as if “blighted;” ultimately the whole upper portion of the frond assumes a rusty brown colour, and seems converted into a panicle of closely packed spore-cases, each of which is borne on a short stalk, and opens vertically into two valves. (Plate I., fig. 1.)

The Royal Fern occurs in boggy or marshy situations throughout Great Britain and Ireland, and is, in fact, to be found all over Europe in favourable situations. It is exceedingly luxuriant in the Lakes of Killarney, where it forms one of the striking features of the district. Dr.

Withering, after enumerating the various stations which he had recorded for this fern, adds: “Though before not to be found for many miles around Birmingham, in the year 1802 it appeared on a butt on Moseley Common, artificially made with mud from a deep pit, in which the

seeds had probably lain for a length of time. It continued to flourish so long as the butt was permitted to remain, but has probably now again disappeared. By such accidental circumstances may we often account for many apparent errors in the stations of plants;" and in a foot-note on the same page he informs us that "the root boiled in water is very slimy, and is used in the north of Europe to stiffen linen instead of starch."

The old herbalists held the Water Fern, or Osmund Royal, in great repute, for Culpepper says, "Saturn owns this plant. It hath all the virtues of other ferns, is much more effectual than they, both for inward and outward griefs, and is accounted singular good in wounds, bruises, or the like. The decoction to be drank, or boiled into an ointment of oil, as a balsam or balm; and so it is singular good against bruises and bones broken or out of joint, and giveth much ease to the colic and splenetic diseases."

The Royal Fern is by no means difficult of cultivation. The root-stock should be dug out in the spring, just as it begins to give signs of vitality, taking care not to cut it up too bare, but to have it well surrounded with the peaty earth in which it delights. It cannot be expected that it will flourish if transplanted to a dry rock-work, or be carefully bedded out with geraniums and petunias. We have seen it *live* for two or three years under such unnatural conditions; but no one who is acquainted with it in its "homes and haunts" would believe in its successful cultivation under such unkind care. Beside a brook, or on the bank of a pond, or amongst the rock-work of an artificial fountain, it will almost attain its natural luxuriance. Mr. John Smith states that it may be cultivated successfully in dry situations, and he has had the advantage of long experience in fern cultivation; but although we have seen it tried thus "many a time and oft," the result never seemed satisfactory as compared with a moist situation, or with the fern as it flourishes by the acre in congenial localities.

A crested variety (*cristata*) was described in the "Gar-

dener's Chronicle" for 1863, which does not attain so great a height, and is sought after by cultivators.

Amongst the various names that have been given to this well-known fern are Royal Fern, Water Fern, Osmund Royal, Flowering Fern, and French Bracken.

THE POLYPODIES.

Clusters of spore-cases, circular and naked. The edge of the frond *not* bent back (or reflexed).

The botanical name of this genus of ferns is *Polypodium*, derived from two Greek words which signify "many-footed." It is one of three British genera in which the clusters of spore-cases are naked, or without any special covering (*indusium*). The Polypodies differ from the Parsley Fern in the clusters of spore-cases always being distinct, and in the edges of the frond being flat and not at all reflexed. They differ also from the Jersey Fern in the circular form of the tufts of spore-cases, which in the latter are elongated.

There are five British Polypodies. Three of these have elongated fronds, and in two of them the outline of the frond is somewhat triangular, and divided into three branches. The following may serve as a key to their differences:

POLYPODIES WITH ELONGATED FRONDS.

COMMON POLYPODY.—Fronds once divided, with the divisions united at the base.

BEECH FERN.—Fronds twice divided, the lower leaflets reflexed. Foot-stalks long.

ALPINE POLYPODY.—Fronds twice divided, the lower leaflets *not* reflexed. Foot-stalks short.

POLYPODIES WITH TRIPARTITE FRONDS.

OAK FERN.—Three divisions equal. Surface of the frond smooth.

LIMESTONE POLYPODY.—Three divisions unequal. Surface of the frond mealy.

COMMON POLYPODY.*

This common fern can scarcely be confounded with any other British species. The root-stock is creeping, and densely covered with chaffy scales. From this proceed the erect lance-shaped fronds, borne upon foot-stalks or stipes, as long as the leafy portion of the frond. The blade of the frond is divided, or deeply cut on each side, from the margin nearly to the mid-rib, in a feathery manner, into narrowly oblong lobes or segments, which are sometimes a little notched at the edges. The *sori*, or tufts of spore-cases, are large, and mostly confined to the upper portion of the fronds. (Plate II., fig. 1.)

If it flourishes in a sheltered situation, some of the fronds will remain green all the year round. Old banks, pollard trunks of trees, the thatched roofs of cottages, and similar localities, are its favourites, but it may often be found on old walls and moist rocks. During a pedestrian tour with a botanical friend through North Wales, we were on one occasion greatly puzzled to determine what plant it was which we saw in the distance covering the entire roof of a cottage. As some time elapsed between our first obtaining a sight of this roof and our arriving close enough to determine the plant, our speculations were manifold. When the truth was made manifest, it appeared under the form of the common Polypody.

This fern is the "rheum-purging Polypody" mentioned by Drayton :

"Here finds he on an oak rheum-purging polypode."

The root was in former times employed in powder for coating pills. In domestic medicine it had a reputation as an expectorant, and the ancients attributed to it other virtues.

Turning again to Culpepper, we read that after rating the physicians for giving the preference to the Polypody of the oak, "the truth is, that which grows upon the

* *Polypodium vulgare*, LINN.

earth is best—it is an herb of Saturn, and he seldom climbs trees, to purge melancholy. If the humour be otherwise, chuse your Polypodium accordingly.” Then he enumerates a long catalogue of diseases for which the Polypody is beneficial, and ends by saying that “the fresh roots beaten small, or the powder of the dried roots mixed with honey, and applied to the member that is out of joint, does much help it; and applied to the nose, cureth the disease called polypus, which is a piece of flesh growing therein, which in time stoppeth the passage of breath through that nostril; and it helpeth those clefts or chops that come between the fingers or toes.”

About twenty varieties are recognized of this common fern. That which is called *omnilacerum* has the margin of all the lobes of the frond cut into long tapering teeth.

The variety *bifidum* has the extremities of the lower lobes forked, with the divisions spreading widely apart from each other.

The variety *Cambricum*, called sometimes the Welsh Polypody, has somewhat of the character of the variety first described; but the lobes are more spreading, broader, closer together, and the frond has a much more compact appearance.

The Irish Polypody (or variety *semilacerum*) is a large fern, with the lower lobes or leaflets again lobed in the middle, and toothed at each end. These secondary lobes are nearly an inch in length. One of the noblest varieties of this fern,

The crested variety (*cristatum*), has the extremity of the lobes, or leaflets, much divided, so as to give them a crested appearance.

In the variety *serratum*, the lobes have toothed or saw-like edges.

The variety *auritum* has its lower lobes with a secondary and smaller lobe on the upper edge near the leaf-stalk.

Most of the other varieties approximate to some of these, or have the starved and nibbled appearance of a variety named *marginatum*.

No special instructions are necessary for the successful

growth of this hardy fern. It will endure dryness much better than the majority of species, and should be planted in a light soil. No outdoor fernery would be complete without it and some of its varieties.

BEECH FERN.*

The root-stock of this fern is wiry and creeping. The fronds have an elongated triangular outline, are from 6 to 12 inches in height, and surmount brittle foot-stalks, which are nearly twice the length of the leafy portion of the frond. The upper portion of the frond is divided nearly to the mid-rib, in a feathery or pinnatifid manner, whilst the lower portion forms distinct leaflets, which are again deeply notched into lobes. The lowest pair of leaflets (*pinnæ*) are directed downwards and outwards. This gives a peculiar character to the frond, distinct from that of any other British species. (Plate II., fig. 2.)

This fern is plentiful in favourable localities, damp rocky places, under the spray of waterfalls, in mountainous districts, and is not uncommon in Wales, the south and north of England, and in Scotland. Occasional in Ireland.

The natural habitat of this plant should be remembered in all attempts at its cultivation. In the chinks of the large stones piled one upon the other, by the roadside in Wales, it flourishes. These walls keep up the soil on one side, where it reaches to the top of the wall. On the other grows the Beech Fern, amidst the percolation of water which is continually draining from the higher land and trickling through the chinks of the wall. Such conditions should be imitated if the plant is to be grown in the open air: it has always succeeded with us in a Wardian case, under the usual conditions, and is a desirable plant for such purposes.

* *Polypodium phegopteris*, LINN.

PLUME POLYPODY.*

In general habit resembling the Lady Fern, with fronds of between 2 and 3 feet in length, branched on each side, the branches again divided into branchlets, which bear the narrow, deeply notched leaflets. As the above name indicates, the habit of the plant is very like a large tuft of green feathers, handsome and attractive, but with the fructification of a Polypody.

Our authority for introducing this as a new species of British Polypodies is Mr. John Smith, of Kew. Three plants were found wild in Yorkshire a few years ago, and then regarded as varieties of the Lady Fern. To this Mr. Smith objects that the tufts of spore-cases are naked, as in other Polypodies, and he adds: "This leaves me no other alternative than to consider it a species of that genus, and consequently a new British species. In doing so, the question arises as to whether it represents an ancient species not before noticed, or the modern result arising from the power of Nature to generate new forms, in accordance with the Darwinian theory of creation of species."

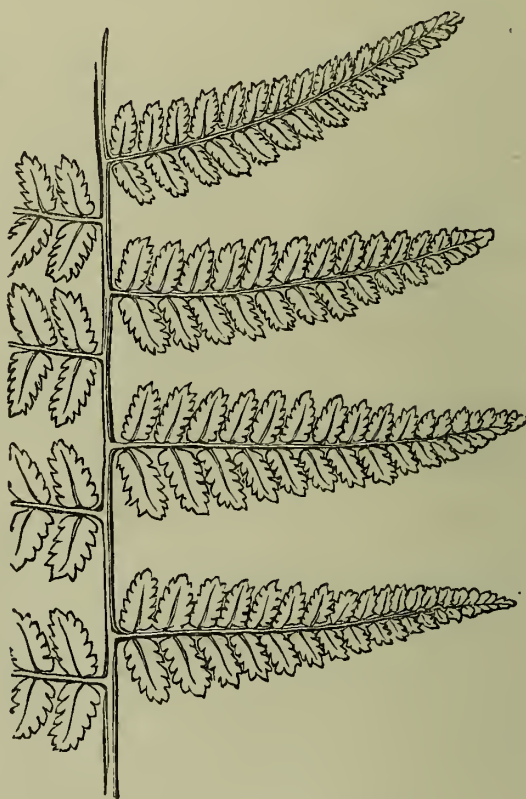
Of this plant we have no knowledge whatever, and insert it here solely on authority. Whether the variety called *plumosum* of the Lady Fern, which may be had at some nurseries, is the same plant, we have had no opportunity to determine. It is singular that two Polypodies should have been confounded with the Lady Fern, and regarded as varieties in this country.

ALPINE POLYPODY.†

The Alpine Polypody was long confounded with the Lady Fern, to which it has, at first sight, great resemblance. The root-stock is short, producing from its crown tufts of fronds. These fronds are borne on short scaly

**Phegopteris plumosa*, SM.† *Polypodium alpestre*, HORRE.

foot-stalks, and though sometimes not more than 8 or 9 inches in length, will even attain, under favourable circumstances, 3 feet, or more. The fronds are not only divided into separate distinct leaflets along each side of the mid-rib, with a lance-shaped outline, but each of these leaflets is again divided to the centre in a feathery manner into lobes or segments, called pinnules. It is therefore called bi-pinnate. The pinnules, or ultimate



ALPINE POLYPODY (*Polypodium alpestre.*)

sub-divisions, are between oblong and egg-shaped, and sharply toothed along the margins. So deeply cut are the marginal teeth in some cases, that the frond has the appearance of being again pinnate, tri-pinnate, or three times divided in a pinnate manner.

It is plentiful on the Scotch mountains up to a con-

siderable elevation, and is often found in company with the Lady Fern.

A desirable variety is cultivated under the name of *flexile*, the fronds of which fall back nearly horizontally, and are almost destitute of foot-stalks. The average length is from 9 inches to a foot, and it is altogether much more elegant than the original form.

It is not many years since the Alpine Polypody was first recognized as a distinct species, and even now some persons express doubts whether it occupies its proper position amongst the Polypodies.

No special cultivation seems to be necessary for this fern. It is too large for any ordinary-sized Wardian case, but can be grown in pots in the greenhouse, or in a sheltered open-air fernery.

OAK FERN.*

The Oak Fern has a slender creeping root-stock, from which proceed the graceful triangular fronds, borne on slender, dark-coloured stipes, twice the length of the leafy portion of the frond. The outline of the fronds is triangular, divided into three nearly equal branches, the outline of which is also triangular. Each branch has its lower portion divided into distinct leaflets, which are again divided nearly to the central vein in a feathery manner. The upper portion of the branches is cleft into lobes, gradually becoming more divided towards the base. Hence the branches are said to be pinnatifid above, and pinnate below, with the *pinnæ* again pinnatifid. The *sori* are scattered about the under surface of the frond.

This fern is not uncommon in Wales, in the north of England, and in Scotland, in mountainous situations. When growing in the chinks of the stone walls along the roadside in Wales, it flourishes freely, but to remove it is a task of no small difficulty. Indeed, it is almost impossible to get out the roots entire, except by removing the stone above or below it.

* *Polypodium dryopteris*, LINN.

In a fern-case this plant will thrive well, and is much better calculated for such a situation than for the open-air fernery. Its slender, graceful form, small size, and drooping habit, all tend to render it a favourite for indoor



OAK FERN (*Polypodium dryopteris*.)

cultivation. In its native localities it evidently seems to prefer a damp situation, growing luxuriantly amid the moisture which percolates through the rough stone walls, or beneath the spray of waterfalls. In such situations, barren fronds are by far the most common, for when very luxuriant, it is often difficult to find a fertile frond. When growing in a large patch under the shadow of rocks, it is exceedingly handsome.

It is a smaller and more delicate plant than the Limestone Polypody.

LIMESTONE POLYPODY.*

This Polypody and the Oak Fern differ from all other British Polypodies, in the fronds being divided into three parts or branches. In the present fern the lower branches are not equal in size to the upper, whilst in the Oak Fern the three branches are nearly equal. The fronds of the Limestone Polypody are nearly triangular in form, borne on rigid foot-stalks. The branches are pinnate, or divided to the centre into segments, of which the lower branches have the segments again deeply cut or divided, and the upper nearly entire. The whole surface of the frond has a mealy appearance. The *sori* are near the margin on the under surface. It has been called the Limestone Polypody on account of its predilection for calcareous soils, to which it appears to be confined; hence it is very local in its distribution. In the rocky parts of Derbyshire it is not uncommon; but is not confined to that county, since it has been found in more northern and western districts of England. Dr. Hooker found it in India on the Himalayan Mountains at from 5,000 to 8,000 feet elevation, and it is also an inhabitant of the United States of North America. It is hardy, and better for outdoor cultivation than the Oak Fern, not requiring much moisture. A calcareous soil is not essential, though some growers mix old mortar with the compost. (Plate II., fig. 3.)

THE PARSLEY FERNS.

Clusters of spore-cases at first circular, then spreading, naked; edges of fertile fronds bent back.

It is perhaps scarcely applicable or correct to call this the genus of Parsley Ferns, on account of our solitary British species; but as far as that species is concerned, it is preferable to calling them Rock Brakes. This group is named by botanists *Allosorus*, from two Greek words

* *Polypodium Robertianum*, HOFF.

indicating the *variability* in the *tufts* or clusters of spore-cases.

The fronds are of two kinds, which differ considerably in appearance. In the fertile frond the edges of the leaflets are rolled backwards. In the young state the tufts of spore-cases are decidedly round, but, as they mature, become confused together so as almost to cover the leaflets. Only one species is British.

PARSLEY FERN.*

Making a little poetical allowance, this fern may be said to resemble a tuft of parsley, as its name indicates. It sometimes bears the name of Mountain Parsley, and, with less propriety, "Rock Brakes," for it certainly has not the most remote resemblance to the common Brake, or Bracken, and therefore the latter name is only calculated to mislead. The early fronds of this fern are grown in the spring, about May, and are barren. The fertile fronds are longer, with a very different appearance, and are developed later in the summer. To describe the form of the barren fronds is like attempting to describe a parsley-leaf, not to be done very briefly or very satisfactorily without resorting to technicalities. They are about 6 or 7 inches in length, two-thirds of which is occupied by the stalk; the rest is of a long triangular outline, branched and divided into a great number of wedge-shaped leaflets, which are notched at the end. The fertile fronds are rather longer, and the leaflets are narrowly oblong. The clusters of spore-cases, though when young distinctly circular on the backs of the leaflets, soon spread into each other and cover the entire surface. (Plate III., figs. 2, 3.)

The Parsley Fern is rather a local species, being found chiefly in mountainous localities in the north of England and Wales. Even there a stranger may wander day after day and not meet with a plant for several days.

**Allosorus crispus*, BENH.

The Mountain Parsley is a very desirable plant for a Wardian case or pot culture. It requires a little care in the cultivation, or it is apt to "damp off" from too much moisture at the roots; but with proper attention to drainage, and elevating the crown a little above the surface to prevent the settling of water around it, no difficulty is experienced. The fronds appear in May, and disappear with the early frosts of autumn.

GOLD AND SILVER FERNS.

Clusters of spore-cases elongated and naked.

The beautiful Gold and Silver Ferns of warm climates, so much admired in our conservatories, have one solitary representative in these uncongenial climes, and even this is confined to the island of Jersey, being politically, rather than geographically, British.

The genus *Gymnogramma* (which means literally "writing") contains some of the most delicate and graceful of ferns, which, from the silvery whiteness or golden yellow of the under side of their fronds, are popularly known as Gold and Silver Ferns. In this group, although the clusters of spore-cases are naked and uncovered, as in the Polypodies and the Parsley Fern, they differ in one important feature: that the clusters of spore-cases are long and line-like, and not circular, as in the other groups just named.

As might be expected, there are a number of species of these ferns which are almost constantly confined to tropical countries, but the Jersey Fern, an exception to this rule, is a native of Southern Europe.

THE JERSEY FERN.*

Doubts may be entertained whether this species should have been included as British at all, since it has only occurred in the island of Jersey. The station being thus

* *Gymnogramma leptophylla*, DESV.

given, however, no one need be deceived into the belief that it has been found in England.

It is a little unpretending plant of not more than 2 or



3 inches in height on the average, although the fertile fronds will in the autumn sometimes attain 5 or 6 inches. A well-grown fertile frond will be found to resemble a small frond of the Parsley Fern. The stalk of the frond has short branches on each side, and along these branches the leaflets are disposed. The leaflets are nearly wedge-shaped, commonly divided into three lobes, which are notched at the apex. The spore-cases are produced in lines along the veins, which are at first distinct enough, but, as they attain maturity, approach each other so closely as to appear as if the spore-cases were scattered over the

whole under surface of the frond.

This plant will grow from the spores freely, but, as an annual, it is not of much value as an ornamental fern, either for pot culture or the Wardian case, especially as it should be grown in a "stove" to insure success.

It is a native of Middle and Southern Europe, the isles of the Mediterranean, and Northern Africa, and has also been found in Mexico.

THE BOSS FERNS.

Clusters of spore-cases circular, with a kidney-shaped covering, attached by the edge.

The Boss Ferns, or, as they are sometimes called, Buckler Ferns, include some of the commonest and best

known of British species. Their generally accepted botanical name is *Lastrea*, which they received in honour of a French botanist, and most of the species are large. The clusters of spore-cases are almost circular, and have a kidney-shaped covering, which is attached by the concave side, near the notch or indentation. In some respects they are similar to the Lady Ferns, but in the latter the tufts are longer, the coverings more elongated, and the outer margin is fringed. They differ from the Shield Ferns in the kidney shape of the coverings; and from the Bladder Ferns by the same feature, and the coverings not being hooded.

The following are recognized British species, all of which are too large for growing in Wardian cases, but are easily cultivated in pots or the open air.

I. FRONDS (PINNATE) ONCE DIVIDED.

MARSH FERN.—Fronds spear-shaped without glands, root-stock creeping.

MOUNTAIN BOSS FERN.—Fronds spear-shaped, covered with glands, root-stock tufted.

CREST FERN.—Fronds narrow, with oblong leaflets and pale scales.

II. FRONDS (BI-PINNATE) TWICE DIVIDED.

MALE FERN.—Fronds spear-shaped, spore-cover not fringed.

STIFF BOSS FERN.—Fronds triangular, leaflets without spiny teeth, spore-cover fringed.

SPINY BOSS FERN.—Fronds narrow, spear-shaped, leaflets with spiny teeth, scales broad.

CRISPED BOSS FERN.—Fronds triangular, curled, with spear-shaped toothed scales.

III. FRONDS (TRI-PINNATE) THRICE DIVIDED.

BROAD BOSS FERN.—Fronds spear-shaped, much divided, lobes with spiny teeth.

MARSH FERN.*



The root-stock of this fern is creeping, a feature by which it may be distinguished from the Mountain Fern, which is most closely allied to it. The fronds are scattered, and not produced in dense tufts, those which are barren being the smallest, and from 8 inches to a foot high, when very vigorous attaining to 18 inches or 2 feet. The outline of the frond is spear-shaped, with a long foot-stalk, in colour of a delicate yellowish green. The leaflets are compound, long, and narrow, and arranged in a feathery manner; throughout their whole length they are cut nearly to the mid-rib into long narrow lobes. The leafy portion of the frond is scarcely so long as the lower and naked portion of the leaf-stalk. The fertile fronds are larger, attaining from 18 inches to 3 feet; they appear to be more taper, and the leaflets narrower, from

* *Lastrea thelypteris*, PRESL.

the margins being curled inwards. The spore-cases are in circular tufts, at first covered by a little thin membranaceous cover, which speedily falls away.

Acres of marsh land are often to be seen with the fronds of this fern thickly scattered over them. It is undoubtedly common enough in such localities in England, though not so plentiful in Ireland.

If the plants are taken up for transplanting with plenty of the original peat about the roots, and when planted the soil covered with pieces of stone to check evaporation, there will be no difficulty in growing them without any extra supply of moisture.

MOUNTAIN BOSS FERN.*

*a Mountain
Boss Fern*

The root-stock is thick, and bears at its summit the erect tufts of feathery fronds, from 2 to 3 feet in height. Draw one of the fronds through the hand, or tread it under foot, and its fragrant odour will give evidence of its claim to be regarded as the "Fragrant Mountain Fern." The outline is spear-shaped, with a very short foot-stalk. The branches or leaflets diminish upwards and downwards, so that the lowest leaflets are reduced almost to a lobe. The leaflets are arranged opposite to each other on the leaf-stalk, and are long and narrow at the broad part of the frond, each leaflet being cut nearly to the mid-rib into numerous long, narrow, feathery lobes. The lower surface of the fronds is covered with minute glands, which contain the balsamic secretion to which their odour is due. (Plate IV., fig. 1.)

We have seen this plant growing commonly enough in the wooded sides of the Welsh mountains, where its erect "shuttlecock" habit is sufficient at once to recognize it. It is far from uncommon in similar localities in England and Scotland, though said to be somewhat rare in Ireland.

This is regarded by some a difficult, or, at the least, uncertain, plant to cultivate. A variety of soils have been recommended, but this is not of so much importance

* *Lastrea neopteris*, PRESL.

or Lushen mountain.

as having a good ball of the original soil about the roots when transplanted. In the open air it will succeed in a moist shady situation, and from its mode of growth prove an acquisition to the outdoor fernery.

The variety *crispa* has the leaflets puckered, so as to give a crisped appearance to the frond.

In the variety *curvata*, the narrowed fronds are curved downwards.

Another variety, *truncata*, is more singular than handsome. The extremity of the fronds and the tips of the branches are abruptly shortened, as if the leafy portion had been nibbled away, leaving a portion of the naked leaf-stalk projecting.

CREST FERN.*

From a stout branching root-stock this fern sends up its tufts of nearly upright fronds for 1 or 2 feet. The outline of the frond is narrow and of equal width below, but terminating upwards in a point. The branches are more correctly leaflets cut deeply into rounded lobes, but seldom divided quite down to the mid-rib. Each lobe is sharply toothed around the edge. The tufts of spore-cases are arranged in a single line on each side of the central vein of the lobes. They have a roundish, pale-coloured covering, which communicates a decided and characteristic appearance to the under side of the fronds.

This is a local species, being found only in boggy places in three or four English counties, the largest number of stations being in Norfolk. (Plate IV., fig. 2.)

It is not a difficult fern to cultivate, growing freely in a soil composed entirely of what is called in the eastern counties "hard turf," which is hard enough to fly into fragments under the stroke of a hammer. This turf is pounded quite small, the finer the better, and the roots imbedded in it. Of course this fern is too large and coarse for the Wardian case, but may with advantage take its place in the outdoor fernery.

* *Lastrea cristata*, PRESL.

The spores or seeds of all ferns are exceedingly minute; and in former times it was believed that they could only be seen on St. John's Night, at the hour when the Baptist was born, and that whoever became possessed of them was thereby rendered invisible.

"But on St. John's mysterious night,
 Sacred to many a wizard spell,
 The time when first to human sight
 Confest the mystic fern-seed fell:
 Beside the sloe's black knotted thorn,
 What hour the Baptist stem was born—
 That hour when heaven's breath is still—
 I'll seek the shaggy fern-clad hill,
 Where time has delved a dreary dell,
 Befitting best a hermit's cell;
 And watch, 'mid murmurs muttering stern,
 The seed departing from the fern,
 Ere wakeful demons can convey
 The wonder-working charm away,
 And tempt the blows from arm unseen,
 Should thoughts unholy intervene."

"Fern-seed," says Grose, "is looked on as having great magical powers, and must be gathered on Midsummer Eve. A person who went to gather it reported that the spirits whisked by his ears, and sometimes struck his hat, and parts of his body; and, at length, when he thought he had got a good quantity of it, and secured it in papers and a box, when he came home he found both empty." Torreblanca suspected those persons of witchcraft who gathered fern-seed on Midsummer Eve.

Brand states in his "Popular Antiquities" that "a respectable countryman, at Heston in Middlesex, informed him in June, 1793, that, when he was a young man, he was often present at the ceremony of catching the fern-seed at midnight on the Eve of St. John Baptist. The attempt, he said, was often unsuccessful, for the seed was to fall on the plate of its own accord, and that too without shaking the plant."

Ben Jonson, in one of his plays, says, alluding to this custom:

"I had
 No medicine, sir, to go invisible—
 No fern-seed in my pocket."

Those ancestors of ours imagining that ferns produced a

seed which was invisible, by an extraordinary process of reasoning concluded that they who possessed the secret of wearing this seed about them would become invisible, a superstition which was ridiculed by Shakespeare. Even in the time of Addison the notion was not altogether exploded, for in the "Tatler" he laughs at a doctor who was arrived at the knowledge of the green and red dragon, and had discovered the female fern-seed. Hudibras also alludes to the same belief:

"That spring-like fern, that insect weed,
Equivocally without seed."

Indeed, there are numerous allusions in older writers of invisibility conferred by ferns, as in an ancient tract of the time of Queen Elizabeth: "I thinke the mad slave hath tasted on a ferne-stalke, that he walkes so invisible." A little dash of superstition with regard to ferns lingers still with the working population in out-of-the-way rural districts.

MALE FERN.*

One of the commonest and most robust of large ferns found in this country. The root-stock is as thick as one's arm, and produces at its summit the tufts of feathery fronds 2 or 3 feet long, with a scaly foot-stalk, and the outline of the leafy portion spear-shaped. The branches or leaflets are subdivided throughout their entire length into long narrow lobes, which are distinct from each other near the leaf-stalk, but not being cut down entirely to the mid-rib towards the apex of the leaflets, the lobes are connected with each other at their base at the outer extremity of the leaflets. The tufts of spore-cases are produced freely on the back of the fronds, at the lower end of the leaflets, the outer portion being commonly barren. (Plate III., fig. 1.)

It would be absurd to attempt giving localities for this fern, which is common everywhere in sheltered situations. Perhaps it deserves to be considered the commonest of the tufted species found in this country.

* *Lastrea filix-mas*, PRESL.

The root-stock of this fern is continually in use as an anthelmintic in the cure of tape-worm. Dr. Lauder Lindsay says that it is commonly used in Edinburgh and other parts of Scotland; and that in many parts of England nothing is more common as a vermifuge than from half a drachm to a drachm of the powder of the root in the form of an electuary, with a little treacle or jelly.

The Male Fern was first used at Geneva by Peschier, thirty or forty years ago, in the form of an ethereal extract; but it appears to have been recommended by Theophrastus, Dioscorides, and Galen.

In the reign of Louis XV. of France, one Madame Noufleur sold the root of this fern as a secret specific for the cure of tape-worm, which secret the king purchased for a large sum of money, and then his physicians discovered it to be the same remedy as that employed by Galen.

Probably the only medicinal use to which ferns are applicable is that of an anthelmintic. This property seems to be attributed to a large number of species in different parts of the world. At the Cape of Good Hope, under the name of *Inkomankomo*, or some such barbarous appellation, the rhizomes of a fern are thus employed, and in some parts of Asia other species have a like reputation.

Gunner relates that the young curled leaves, at their first appearance out of the ground, are by some boiled and eaten like asparagus—at least so says Lightfoot—and that the poorer Norwegians cut off those succulent *laminæ*, like the nails of the finger, on the crown of the root, which are the bases of the future stalks, and brew them into beer, adding thereto a third portion of malt; and in times of great scarcity mix the same in their bread.

One of the largest of the varieties of the Male Fern is that called *paleacea*, in which the fronds will measure 12 inches across, and from 4 to 5 feet in length. The stalks are densely covered with large brown scales.

The crested form (*cristata*) resembles, in its branching and cresting, similar varieties of other species, the extremity of the frond and the extremities of the side

branches being divided and subdivided so as to form tufts or crests.

The variety *abbreviata* has been considered by some as a separate species, but without sufficient cause. It is more dwarf than the common form, seldom exceeding from 12 to 18 inches.

Another large variety is that named *incisa*, in which the terminations of the branches and the leaflets are sharp pointed: the leaflets have shallow teeth. All the margins are more cut than in the common form, which gives the plant a more graceful appearance.

The extreme of size in an opposite direction will be found in the little variety *pumila*, which does not much exceed 6 inches in height.

Altogether there are about twenty named varieties of the Male Fern, of which the above are some of the most striking.

For the outdoor fernery or pots it grows freely, and endures well the smoke of towns. No situation or soil seems to come amiss, and very little trouble is demanded for its cultivation. Its usual forms are all too large and coarse for the Wardian case.

STIFF BOSS FERN.* *or Rigid Suckler*

The root-stock of this fern is thick, producing at its summit a tuft of fronds from a foot to 18 inches or upwards in length. The outline of the fronds is narrowly triangular, with a densely scaly foot-stalk. The branches are arranged in a feathery manner, the lowest being the longest, and decreasing upwards. The leaflets are oblong, and blunt at their extremity, cut at the margin into broad, rounded, shallow lobes, which are toothed along the edge. The whole surface of the frond is sprinkled with glands, which are without stalks. These, when the plant is bruised, communicate a faint odour. The clusters of spore-cases have a kidney-shaped covering, which is fringed around the edge with glands. (Plate V., fig. 1.)

* *Lastrea rigida*, PRESL.

Limestone districts in the north of England alone furnish this fern, which was first found at Ingleborough in Yorkshire.

No special precautions require to be taken in the cultivation of this species either in pots or in the open air. Good drainage is essential to this as to most ferns, and ordinary garden soil is all that is required. It is well to elevate the crown a little, so as to avoid the settling of water upon it, and when grown in pots a mixture of loam and peat will suffice.

SPINY BOSS FERN.*

*or possibly broken
Buckler fern*

This fern has a stout branching root-stock, from which the fronds are developed in tufts of from 1 to 3 feet in height. The outline of the fronds is long and narrow, scarcely spear-shaped, with feathery branches of nearly equal length, except near the apex of the frond. The foot-stalk occupies about half the entire length of the frond, and the leafy portion is flat. The leaflets are arranged in a feathery manner along the branches. These are of an elongated oblong outline, deeply cut into numerous lobes, each lobe being in itself surrounded by sharp-pointed teeth or little spines, whence the name of the fern is derived. The leaf-stalk is clad throughout with little scattered pointed scales. The tufts of spore-cases are rather small, and their covering is kidney-shaped, with a waved margin destitute of glands. (Plate V., fig. 2.)

This is only available as an outdoor or a hardy pot fern, requiring no special instructions for cultivation. It is often confounded with other species, and some regard it only as a variety.

CRISPED BOSS FERN.†

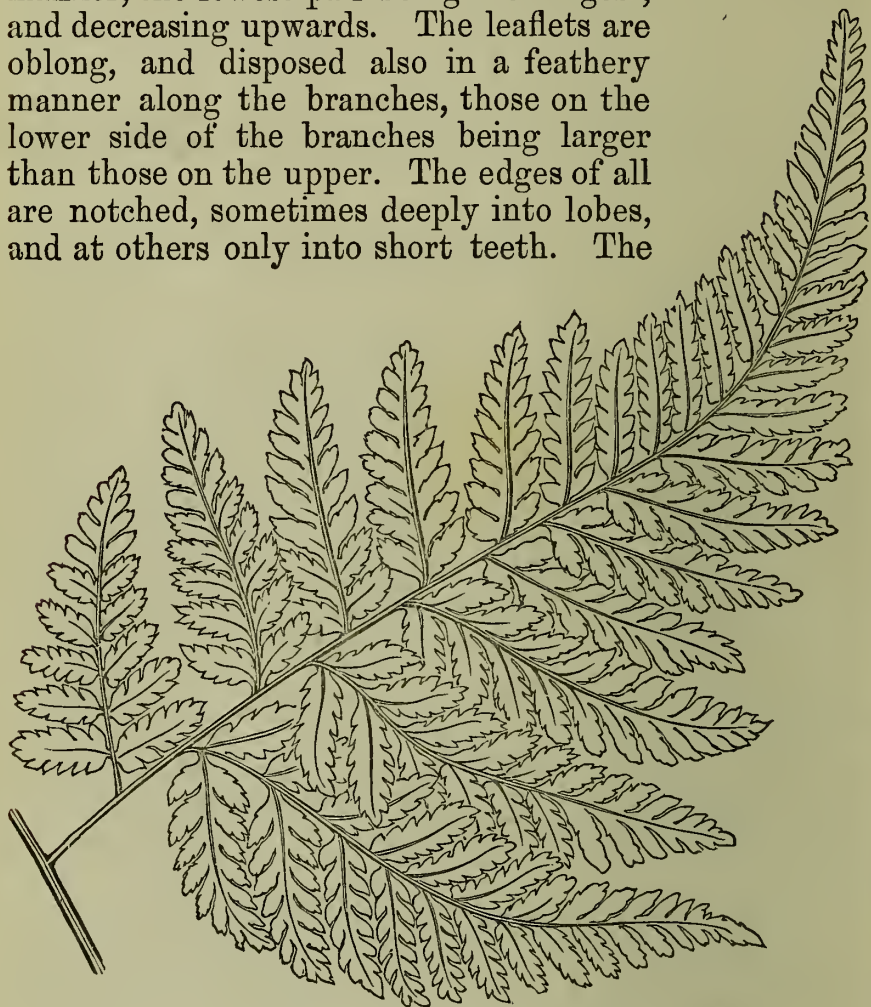
This is sometimes called the Hay-scented Fern and the Triangular Boss Fern. The fronds are produced in a

* *Lastrea spinulosa*, PRESL.

† *Lastrea æmula*, J. SM.

*or possibly broken
Buckler fern*

spreading tuft from the summit of the root-stock, and are from 1 to 2 feet in length. The foot-stalk is clad with narrow scales, and the outline of the leafy portion is triangular. The branches are disposed in a feathery manner, the lowest pair being the longest, and decreasing upwards. The leaflets are oblong, and disposed also in a feathery manner along the branches, those on the lower side of the branches being larger than those on the upper. The edges of all are notched, sometimes deeply into lobes, and at others only into short teeth. The



LEAFLET OF CRISPED BOSS FERN.

edges of all the leaflets are curled inwards, so as to give a characteristic crisped appearance to the fronds. The tufts of spore-cases have kidney-shaped coverings, which are fringed at the edge with stalked glands. Similar glands are also scattered over the fronds. These glands contain

the essential oil which communicates an odour to the plant when bruised.

The Crisped Fern is somewhat local in its distribution, being confined to shady banks and damp woods in the west of England and in Ireland. Its elegant habit and evergreen character render this a favourite either as a pot plant or for the outdoor fernery.

BROAD BOSS FERN.* *or Broad Buckle Fern*

From a large root-stock the fronds are developed in tufts, which are not erect, or nearly so, as in the Male Fern, but curve over in an arching manner, and form spreading clumps of long feathery fronds from a foot to 4 or 5 feet in length. The foot-stalk is thick at its base, and densely covered with pointed, spear-shaped scales. The outline of the fronds, though very variable, is usually spear-shaped, and the branches are disposed in a feathery manner. The leaflets have an oblong outline, deeply cut and lobed in a variable manner, each lobe having its margin set with spiny teeth. The covering of the spore-cases is fringed with stalked glands. This is one of the most complex of the Boss Ferns, passing into almost innumerable varieties and modifications, but retaining its overarching habit. It is regarded by some as a variety of the Spiny Boss Fern. (Plate VI., fig. 1.)

This hardy species is found in shady lanes and damp woods, though by no means partial to swampy localities.

There are fourteen or fifteen named varieties of the Broad Boss Fern. That called *dumetorum* has small triangular-shaped fronds, with broad and closely set leaflets.

The variety *lepidota* is one of the most graceful and elegant, with large and much divided fronds and small leaflets.

This species has also its variety *cristata*, in which the terminations of the side branches are subdivided, and form flattish crests.

The variety *interrupta* is one of those unsymmetrical

* *Lastrea dilatata*, PRESL.

forms in which portions of the fronds have the appearance of being eaten away by slug or snail.

THE SHIELD FERNS.

Clusters of spore-cases circular, and their coverings circular, attached from the centre.

The Shield Ferns have derived this name from the circular shield-like form of the coverings to the round clusters of spore-cases. The botanical name of *Polystichum* is, like the rest, derived from the Greek, and means literally "many-rowed."

There is a certain peculiarity of appearance in these ferns, which will impress itself upon the observer, and soon lead him to distinguish the ordinary forms, without much trouble, from the other British ferns.

The clusters of spore-cases are round, as in the Polypodies, but differ from them in possessing a proper covering (*indusium*). The clusters are also round, or nearly so, in the Boss Ferns, and possess a covering; but the differences between these and the Shield Ferns are, that the covering in the Shield Ferns is circular, and in the Boss Ferns kidney-shaped; moreover, in the Shield Ferns the cover is attached by the middle, and in the Boss Ferns by the notched or indented side.

There are three British species, which may generally be distinguished in the following manner:

HOLLY FERN, with undivided or simple leaflets, toothed at the edges;

PRICKLY SHIELD FERN, with distinct leaflets, wedge-shaped at the base, but not stalked;

SOFT SHIELD FERN, with distinct leaflets, obtusely angular at the base, stalked.

HOLLY FERN.*

The prickly appearance of this fern is very suggestive of its name. The fronds are produced in tufts from

* *Polystichum lonchitis*, ROTH.

the extremity of a scaly root-stock to a height of from 8 to 12 or 14 inches. The form of the outline of the frond is narrowly spear-shaped. The leaflets are closely arranged on each side of the leaf-stalk, so that they partially overlap each other. The lower edge of the leaflets is convex, and the upper concave, with a projection at the base, and the edge is armed all round with spiny teeth. The clusters of spore-cases form a line on each side of the mid-rib, and about midway between the mid-rib and the margin of each leaflet. This species differs from both the Prickly Shield Fern and the Soft Shield Fern, in the leaflets being arranged in a single row on each side of the leaf-stalk. (Plate VI., fig. 2.)

The Holly Fern is a truly mountain species, growing in such localities in Scotland, Wales, and Ireland. It is not an easy fern to cultivate, but in a moist shady situation will sometimes succeed. As a pot plant in a greenhouse, or in a fern-case, it is more likely to survive the winter; but, as in all other ferns, good drainage must not be disregarded.

PRICKLY SHIELD FERN.*

The tuft of fronds in this species rises from the crown of the root-stock for a foot or 18 inches, and in favourable situations 2 feet and upwards. The outline of the fronds is spear-shaped, sometimes broadly spear-shaped, and sometimes narrowly spear-shaped. The foot-stalk is thickly covered with rusty brown scales, with branches on each side through the greater portion of its length. The leaflets are of a glossy green, and rather stiff, tapered to a point in both directions, but rather more rapidly below, so as to form a wedge-shaped angle at the base of the leaflets, which is attached to the branch without any appreciable stalk. The upper edge of each leaflet has near its base a conical projection. The apex tapers to a sharp point, and the edge is toothed all round. The tufts of spore-cases form a line on each side of the mid-rib of the leaf-

* *Polystichum aculeatum*, ROTH.

lets, each tuft having a circular covering attached by a stalk from the centre. (Plate VII., fig. 1.)

The usual home of this species is on hedge banks, where some of the fronds may be found green all the year round.

The only varieties of which we have any knowledge is a crested form called *cristatum*, and the very distinct variety *lobatum*.

With plenty of room, either in pots or the open air, this plant is easily cultivated. In any situation it forms a pretty contrast to the Polypodies and Boss Ferns.

SOFT SHIELD FERN.*

The large fronds of this fern are sometimes 3 or 4 feet in length, though often less than 2 feet, and are produced in a tuft from the crown of the thick root-stock. They are of a much softer texture than in the Prickly Shield Fern, though of a similar spear shape in outline. Some botanists regard them as varieties of the same fern. Throughout its whole length the mid-rib is clad with rusty scales, and about three-quarters of the entire length is occupied by the leafy portion. Branches arranged in a feathery manner on each side of the leaf-stalk bear the leaflets. These are generally most curved on the edge which is turned towards the foot-stalk, the other edge having a prominent projection or conical lobe near its base. The apex of the leaflets is usually bluntly pointed, as is also the base, and each leaflet is attached to the branch by a short stalk. As in the other species, the tufts of spore-cases are arranged in a line on each side of the mid-rib of the leaflets. Though closely allied to the Prickly Shield Fern, the present species may be distinguished by its softer texture and stalked leaflets, as well as their blunter extremities. The Soft Shield Fern is also found on shady hedge banks and woods, and is very generally distributed. It is not so hardy as the Prickly Shield Fern, but may be cultivated readily with success. (Plate VIII., fig. 1.)

Of this very "sportive" fern there are no fewer than

* *Polystichum angulare*.

sixty varieties. That called *decurrrens* has a good habit; the fronds are very tapering at the summit, the leaflets narrow, pointed, and prominently lobed at the base.

The crested form (*cristatum*) has the extremity of the fronds and the tips of the branches subdivided in the form of a tassel or crest.

The variety *laciniatum* has the leaflets deeply cut into long bristly teeth

The variety *gracile* has a very delicate and graceful habit. The leaflets are small and at some distance apart; the leaf-stalk and branches are thin and delicate, and the whole appearance attractive.

One of the noblest forms is that named *decompositum*, in which the leaflets are many of them cut quite down to the mid-rib. The fronds attain from 2 to 3 feet in length. An allied variety is called *subtripinnatum*, and has a similar general character.

The handsomest of all is undoubtedly *plumosum*, in which the fronds will reach 9 inches in width and nearly 3 feet in length. It has a spreading, plume-like habit, but is unfortunately a gem which is "rare" as well as "rich."

The variety *lineare* is one of the starved-looking varieties, with more uniformity and grace than in the majority of such forms.

The variety *abruptum* is curious from the abrupt manner in which the branches are shortened.

The shortened leaflets in the variety *dissimile* impart a pleasing character, and render it a desirable form for cultivation.

The variety *biserratum* is remarkable for its large broad leaflets.

Finally, there is a variety called *proliferum*, which bears little plants at the angles, formed by the branches with the mid-rib.

THE LADY FERNS.

Clusters of spore-cases oblong, with a kidney-shaped covering, fringed at the outer edge.

We employ the somewhat doubtful term Lady Ferns

to designate the genus which is known to botanists as *Athyrium* (opened), with the only excuse that its single British representative is known as the Lady Fern. The features by which these ferns are distinguished from those nearest allied to them, though somewhat minute and technical in some instances, are nevertheless regarded as sufficient reason for keeping them distinct. The clusters of spore-cases have a somewhat kidney-shaped covering, similar to those in the Boss Ferns, attached by the concave side, but the outer or convex margin is fringed with hairs, which is not the case in the Boss Ferns. Although in some features closely related to the Spleenworts, yet the form of the clusters, and of their covering, as well as the fringed outer margin, are sufficient to indicate that there is a great and important difference between the Lady Ferns and the Spleenworts, notwithstanding that some authors have grouped them together. The most likely mistake which the beginner may make is to confound the Lady Fern with the Male Fern and its allies; but this mistake a closer examination will rectify, for it will be observed that the tufts of spore-cases are elongated and not round, often assuming a horse-shoe shape.

LADY FERN.*

As seen growing near the margin of Bala Lake in North Wales, this is truly a magnificent fern, for we have measured fronds of 5 feet in length, and counted from thirty to forty of such fronds in a single tuft. The root-stock is thick, rising a little above the surface, and the outer fronds bend over to the ground, whilst the inner ones stand nearly erect. About one-third of the leaf-stalk at the base is bare, the rest is occupied by the frond, which has a spear-shaped outline. The branches have a feathery arrangement, and are sometimes opposite to each other in pairs, but more often alternate, about forty on each side. The leaflets have in the outline the shape of a spear-head, deeply cut into lobes throughout their length.

* *Athyrium filix fœmina*, ROTII.

The details of form are liable, however, to considerable variation. The texture as well as habit of this fern is delicate, and the veins very distinct. The clusters of spore-cases are produced freely on the under surface of the leaf-lets: their form has already been indicated. (Pl. IX., fig. 1.)

Abundant on hedge banks and moist woods; in Ireland flourishing in boggy places. It is a very easy fern to cultivate, but it does not grow well amid London smoke, where the Male Fern flourishes freely. It will succeed equally out of doors or in a pot in a green-house, and should have plenty of room.

Calder Campbell has written some lines on this fern, which deserve remembrance:—

“If you would see the lady fern
 In all her graceful power,
 Go look for her where woodlarks learn
 Love-songs in a summer bower;
 Where not far off, nor yet close by,
 A merry stream trips on,
 Just near enow for an old man’s eye
 To watch the waters run,
 And leap o’er many a cluster white
 Of crowfoots o’er them spread;
 While hart’s tongues quiet with a green more bright
 Where the brackens make their bed.
 Ferns all—and lovely all—yet each
 Yielding in charms to her
 Whose natural graces Art might teach
 High lessons to confer.
 Go look for the pimpernel by day,
 For Silene’s flowers by night,
 For the first loves to bask in the sunny ray,
 And the last woos the moon’s soft light;
 But day or night the lady fern
 May catch and charm your eye,
 When the sun to gold her emeralds turn,
 Or the moon lends her silver dye.
 But seek her not in early May,
 For a Sibyl then she looks,
 With wrinkled fronds that seem to say,
 ‘Shut up are my wizard books!’
 Then search for her in the summer woods,
 Where rills keep moist the ground,
 Where foxgloves from their spotted hoods
 Shake pilfering insects round;
 Where up and clambering all about,
 The traveller’s joy flings forth
 Its snowy awns, that in and out
 Like feathers strew the earth.
 Fair are the tufts of meadowsweet
 That haply blossom nigh,
 Fair are the whorls of violet
 Prunella shows hard by;

But not by burn, in wood, or dale,
 Grows anything so fair
 As the plummy crests of emerald pale
 That waves in the wind, or soughs in the gale,
 Of the lady fern, when the sunbeams turn
 To gold her delicate hair."

Poets are allowed a little license, but in the present instance that permission has not been by any means abused. It would be difficult, indeed, to extol too highly one of the most magnificent and graceful, perhaps *the* most splendid, of British ferns. What others gain in height the Lady Fern offers as a counterpoise in the delicate incisions of her feathery fronds. This is evidently a favourite fern with poets—no bad judges of beauty, by-the-bye—for Scott has given a faithful picture of the haunts it loves:

"Where the copse-wood is the greenest,
 Where the fountain glistens sheenest,
 Where the morning dew lies longest,
 There the lady fern grows strongest."

Out of sixty or seventy recognized varieties of this fern which are in cultivation, we will only attempt to enumerate a few of the most typical or attractive.

Near the sea the variety *marinum* has been found at Aberdeen. The fronds are rather small, broad at the centre, and tapering gradually upwards and downwards.

The variety *rhæticum*, which grows in boggy places, differs considerably in appearance from the usual form: the fronds are smaller, narrower, the leaflets shorter, and in habit it is more erect.

The broad-leaved *latifolium* is a more desirable variety for cultivation. It attains a good size, and the large broad leaflets give it a most distinct and noble appearance.

The tasselled variety (*multifidum*) is one of the greatest favourites in cultivation. The fronds are of the usual size and form, except that the apex is furnished with a branched tuft resembling a tassel, with a smaller one terminating all the side branches.

The same character prevails in *depauperatum*, which is smaller, and has the same starved and poverty-stricken appearance which characterizes the variety *depauperatum* of other species, as the name indicates.

The variety *crispum* is very small, and has whilst growing a pretty parsley-like appearance, from the complex branching of the fronds.

Certainly the most singular of all forms is that known by the name of *Frizelliæ*, in which the fronds are not an inch in width, with kidney-shaped leaflets divided in two parts, which overlap each other, and toothed at the edge. These are attached to each side of the leaf-stalk, and more resemble a large Spleenwort of the *Trichomanes* kind than a variety of the Lady Fern.

THE SPLEENWORTS.

Clusters of spore-cases elongated, and parallel, with a straight covering.

The botanical name of the Spleenworts is *Asplenium*, of Greek origin, and associated originally with some species of fern supposed to be beneficial in diseases of the spleen. The clusters of spore-cases in this genus are lengthened out into a kind of brown line, in which feature they agree with the Gold and Silver Ferns; but they differ from these in the spore-cases having a true covering, which opens along that side of the cluster which is towards the mid-rib of the fern. From the Hart's Tongue Fern the Spleenworts differ in the clusters not growing in pairs, and in the splitting of the covering.

The nine British species may, for our present purpose, be classed in four sections. In one section the frond, though divided, has no proper leaflets. This contains—

FORKED SPLEENWORT.—The fronds are narrow and spear-shaped, cleft in a forked manner.

In the second section the frond is divided into leaflets which are wedge-shaped. This includes—

ALTERNATE SPLEENWORT.—Leaflets single on either side of the stalk;

WALL-RUE SPLEENWORT.—Leaflets in threes at the ends, and on each side of the stalk.

In the third section the leaflets of the frond are either oval or oblong. This includes—

GREEN SPLEENWORT.—Leaflets not much larger than broad, stalk green above ;

WALL SPLEENWORT.—Leaflets not much larger than broad, stalk black throughout ;

SEA SPLEENWORT.—Leaflets twice, or more, longer than broad.

And in the fourth section, the leaflets of the frond are again more or less divided into segments. This contains

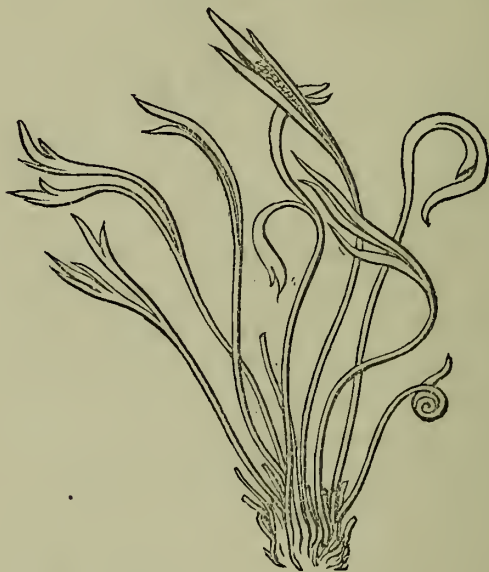
ROCK SPLEENWORT.—Fronds narrow, spear-shaped, stalk smooth ;

BRISTLY SPLEENWORT.—Fronds broadly spear-shaped, stalk scaly.

BLACK MAIDENHAIR.—Frond triangular, stalk smooth, black below.

FORKED SPLEENWORT.*

This singular little fern grows in tufts of about 3 or 4 inches in height, from a fibrous mass of root-stock and



rootlets. The fronds are very narrow, scarcely leaf-like, with one or two branches of the same nature, and each

* *Asplenium septentrionale*, SCHK.

division toothed or split at the apex. The lower part of the frond, or its stalk, is long, and so gradually and imperceptibly widens into the blade or flat upper portion, that it is almost impossible to say where one ends and the other begins. Three or four lines of spore-cases are developed on the back of the fronds, and these, as they mature, run into each other so as to cover the whole surface. When in fruit, the brown frond might be compared to a miniature "stag's horn," and it is almost a marvel that the fern has not acquired this as one of its local or popular names.

Sparingly found on rocks and walls in North Wales, the north and west of England, and more commonly in Ireland. It is reported of it that it will succeed in a Wardian case, but not so well if unprotected by glass. Never having attempted to grow it, we cannot give the result of experience.

ALTERNATE SPLEENWORT.*

This little fern grows in tufts of 4 or 5 inches in height, having somewhat the appearance of a starved form of the Wall Rue, of which some botanists regard it as a variety. The fronds are erect, and consist of a slender wiry stalk, with little wedge-shaped leaflets on each side. These leaflets are *not* placed opposite to each other, but alternately, and diminish in size gradually towards the top of the frond. Each leaflet is notched at the apex, and the lower ones are so deeply cut as to form one or two little teeth or lobes at the sides of the leaflets. The spore-cases are arranged in little lines, of which two or three will be found on the back of each fertile leaflet.



**Asplenium Germanicum*, WEIS.

This species is found but sparingly in Scotland, and the "lake districts" of England, nor is it anywhere common. It is said to grow also near Llanrwst in North Wales, and in the Pass of Llanberris. The treatment it requires is probably the same as would succeed with the Wall Rue. It is much given to damping off, if too much moisture accumulates about the fronds.

WALL RUE.*

The rue-leaved Spleenwort, or Wall Rue, forms little dull green tufts, proceeding from a mass of wiry rootlets. Its name is well merited, for the form, size, and colour of the fronds resemble little bunches of the common garden



"rue." The tufts usually are from 2 to 4 inches in length, but we have collected many a tuft in North Wales which exceeded 6 inches. The tough wiry leaf-stalk is comparatively long, and bears at the apex, and on each side, wedge-shaped leaflets in clusters of threes, whereas in the Alternate Spleenwort the leaflets are single. There is considerable irregularity in the form of the leaflets, and some deviations in the arrangement of them; but the description above given will be sufficient to distinguish this from the only species with which it is likely to be confounded. The clusters of spore-cases are ar-

anged in lines on the under surface of the fronds, and the covering splits with a jagged or toothed edge, whilst in the Alternate Spleenwort the edge of the covering is smooth.

Though rare in the neighbourhood of London, this is

* *Asplenium ruta-muraria*, LINN.

not an uncommon species. In mountain districts it is abundant, and may often be seen flourishing on churches and old walls in other localities.

This fern may be planted on rock-work or walls out of doors, or in a Wardian case; but if the crowns are not elevated so that water cannot rest upon them, the fronds will "damp off."

There is a crested variety of this little fern, and another called *cuneatum*, in which the leaflets are more acutely wedge-shaped, and altogether it closely resembles the Alternate Spleenwort, with which it is sometimes confounded.

Lightfoot states, in his "Flora Scotica," that "it was formerly received in the shops as a pectoral and deobstruent, and recommended in coughs, asthmas, obstructions of the liver and spleen, and in scorbutic complaints, but it is at present out of repute."

GREEN SPLEENWORT.*

From a tapering root-stock proceed downwards a tuft of wiry rootlets, and upwards the bright green fronds of



the Green Spleenwort. These fronds are seldom more than from 4 to 6 or 7 inches in length, though sometimes attaining to 10. They consist of a central wiry green mid-rib or leaf-stalk (for both terms are equally right and equally wrong, but *rachis* is not considered popular), and from a little above the base to the apex pairs of egg-shaped leaflets. The stalk is dark coloured at the bottom only, and green throughout the rest of its length. On the under surface of each leaflet are from two to six lines of spore-cases, which are at first distinct, but at length

* *Asplenium viride*, HUD.

run into each other. The colour of the spore-cases is of a more yellowish brown in the Green than in the Wall Spleenwort, and they are also further distinguished by the colour of the central stalk.

Though not so common as the Wall Spleenwort, this is not a rare species, being found in mountainous districts in Great Britain, but less commonly in the sister island. Dr. Hooker has lately received a specimen of this fern from St. John's, New Brunswick, collected on sea cliffs, Taylor's Island. This discovery is a most interesting one in connection with the glacial migration of Scandinavian plants over the North American continent; the plant being common in the sub-alpine regions of Europe, and also found in the Rocky Mountains, but not occurring in Greenland, or in any other part of North America.

There is no variety, save one in which the leaflets are deeply cut into lobes, and it is doubtful whether that is constant enough to be relied upon. This is a more delicate plant, and requires more care than the common Wall Spleenwort in its cultivation. Whilst it seems impatient of close confinement, it suffers out of doors, unless covered by a hand-glass.

COMMON WALL SPLEENWORT.*

The dense tufts of this fern are generally from 4 to 7 or 8 inches in length, and consist of delicate narrow fronds,



with a slender black shining leaf-stalk, on each side of which the bright green leaflets are disposed in nearly opposite pairs through the greater part of its length.

**Asplenium trichomanes*, LINN.

The leaflets are of a roundish or egg-shaped form, generally slightly notched at the margin. At the upper end of the frond the size of the leaflets is diminished. Two or three elongated tufts of spore-cases are developed on each side of the mid-rib of the leaflets. These often become confused together as they approach maturity, and almost cover the under side of the leaflets. The leaflets often fall away from the leaf-stalk as they grow old, and leave the old stalks like rigid black pieces of horse-hair still adhering to the root-stock. It is sometimes known as the "Maidenhair Spleenwort."

This is not an uncommon species, being widely distributed over the British Isles, but amongst rocks, old stone walls, and ruins it is most abundant. The walls of loose stones piled on each other, which skirt the roads in North Wales, are often green for miles with tufts of this fern.

The varieties of this fern are fewer than in many of the common and largely cultivated species, not exceeding nine or ten characterized forms.

Perhaps the most delicate of varieties is that named *incisum*, from the deeply cut leaflets, each of which is like a fan of spreading, long, narrow lobes.

The branched variety (*ramosum*) is also attractive, as the upper third of the length of the fronds is branched and divided, and again subdivided, so as to present a rather complicated appearance.

The variety *cristatum*, as its name implies, has the upper portion of the fronds crested, or shortly divided and subdivided, so as to present a crisped and crested appearance.

The variety *depauperatum* may be curious, but is not very attractive, with its thin starved-looking fronds, which seem to challenge pity for their miserable and almost skeletonized condition.

All the forms thrive well either in the open air or in pots, but not so kindly in the Wardian case. In all instances the crown must be elevated a little, so that water does not rest upon it. If planted in a case, this must not be too close.

Lightfoot says that this fern was formerly used as an

expectorant by the peasantry of Scotland; the practice, however, seems to have been discontinued.

SEA SPLEENWORT.*

The fronds of the sea-side fern are from 5 to 9 inches in length, though most commonly about 6 inches. The outline is of a narrow spear shape, and it is of a more robust habit than the Green Spleenwort and Wall Spleenwort. The leaf-stalk is dark brown, and bare for the lower third of its length; throughout the rest the leaflets are arranged on opposite sides of the leaf-stalk. Each leaflet is an irregular oblong, widened at the base into a blunt projection on the upper edge. The margin of the leaflets is irregularly notched all round. The spore-cases are in rows on each side of the mid-ribs of the leaflets, the rows being oblique and parallel. (Plate VII., fig. 2.)

This fern is confined to within a mile or two of the sea in the south-west and the Channel Islands, in moist, rocky situations. It cannot be cultivated successfully out of doors, but will accommodate itself to a fern-case exceedingly well, and succeed as a pot plant in a greenhouse.

The author of "Ferry Combes" says, "This plant grows in shady nooks, among the cliffs, attaining the greatest size where some small spring finds its way through the rock. In such a position we found it one lovely summer evening, just as the sun was sinking like a ball of fire into the Atlantic, gilding the craggy cliffs and shining yellow sand with its last rays, a little to the right of Hartland Quay, at the entrance of a large cave, in company with *Osmunda*, within the reach of the spray."

ROCK SPLEENWORT.†

All about Tan-y-bwlch and along the road to Tremadoc has many a weary collector sought in vain for this "missing fern." Here it is said to have been found, and in

* *Asplenium marinum*, LINN.

† *Asplenium fontanum*, BERNH.

some other localities in England, being at the best a very rare, and, as some affirm, a "doubtful native."

It is a small tufted species, not exceeding about 4 inches in height. The fronds are of a narrow spear shape, with a short stalk. The stalk throughout its whole length has a narrow ridge or keel on either side. The leaflets are widened upwards, and end in two or three sharp teeth. These are arranged on short branches on each side of the leaf-stalk, the leaflet next to the stalk on the upper side of each branchlet having four or five sharp teeth at the apex. The clusters of spore-cases are oblong, and, when mature, exhibit a tendency to run together, or become confluent.

We can say nothing from experience of its cultivation, but it has been strongly recommended for Wardian cases. It certainly is quite a gem, and its small size increases its value for indoor culture. Sandy peat is said to furnish a good soil if the fern is to be cultivated in pots.

In his "Nature-printed Ferns," Mr. Moore has drawn attention to a Spleenwort, which was afterwards figured and described by Mr. Lowe in his "Ferns, British and Foreign,"* under the name of *Asplenium refractum*, concerning which he gives the following information: "It was found in Scotland some six or seven years ago by a gardener, who gathered it for the Green Spleenwort. The discoverer died soon after, and nothing appears to be known as to the particular locality in Scot-



*Vol. V., plate 35 a.

land." The fronds are longer and narrower in proportion than in the Rock Spleenwort; the outline also differs, being equal and almost linear, not broader upwards, as in the Rock Spleenwort. The leaflets point downwards (refracted) and the fronds are proliferous.

From this description, and the appearance as delineated in his figure, Mr. Lowe may be right in regarding this as a distinct species from the Rock Spleenwort, but we are not convinced that it would be prudent in any one, upon the above-quoted very slender evidence, to include this amongst British Ferns as "a new species of Spleenwort indigenous to Great Britain."

BRISTLY SPLEENWORT.*

The fronds grow in tufts, a little spreading, and of variable size according to locality, at times not exceeding 3 inches, and occasionally reaching 18, the average being about 6 or 8. The outline of the fronds is spear-shaped, and they consist of a rather scaly stalk, with numerous short branches diverging nearly at right angles, furnished with irregular-shaped, often rounded leaflets, which are sometimes cut into lobes, and at others only toothed at the edges. The clusters of spore-cases are at first distinctly oblong, but as they approach maturity, by spreading out at the centre they assume an almost circular form. They are also developed nearer to the edge than to the mid-rib of the leaflets, and unless care be taken in the examination, this fern may prove a difficult one for a beginner to determine. (Plate VIII., fig. 2.)

The Bristly Spleenwort is seldom found far inland, being abundant in Jersey, and less common in the southern counties of England and Wales. Yet it succeeds exceedingly well in a case, at least as far as our experience goes. Some authors have affirmed that it will not flourish under these conditions, yet we have known it to do so, but to attempt it out of doors would doubtless fail. In a hot-house it will grow vigorously.

* *Asplenium lanceolatum*, HUDS.

The variety *microdon* has its leaflets so simple and undivided, and in character and habit so nearly approaches to the Sea Spleenwort, that one is disposed to leap to the conclusion at once, that this is a variety of the maritime species, and *not* of the Bristly Spleenwort; since, however, it is always regarded as a variety of the latter, although we don't know for what reason, we have so placed it.

BLACK SPLEENWORT.*

The Black Spleenwort is a common fern, which grows in tufts sometimes not more than 4 inches in height, and sometimes as much as 18 or 20, but usually from 6 to 12 inches when growing on banks, and smaller when found on walls. The stalk is a little more than half the entire length. The leafy portion is of a long triangular shape in the outline, and consists of a number of compound leaflets on each side of the stalk, diminishing in size from the base. The leaflets are also triangular, deeply cut almost to the mid-rib, sometimes entirely so, into several lobes, which are notched in a saw-like manner at the edges. The stalks are of a purplish black colour, darkest at the base. The spore-cases in their early stage may be seen in distinct lines on the backs of the fronds, but in more mature conditions they nearly cover the whole under surface. This fern is sometimes called Black Maidenhair, or Black Maidenhair Spleenwort, and in some districts it is locally and erroneously named the Parsley Fern. (Plate IX., fig. 2.)

This is a common species on hedge banks, old walls, &c., delighting most in a sandy soil. In sheltered situations it is evergreen. Any one may cultivate it without trouble, as it will accommodate itself to almost any conditions, and whether in the open air, or the Wardian case, the effect is always pleasing, and success equally sure.

One of the handsomest varieties of this fern is the narrow-leaved form called *acutum*, in which all the extremities, whether of branches or leaflets, are more acutely

* *Asplenium adiantum-nigrum*, LINN.

pointed than in the common form. The outline of the frond is more decidedly triangular, from the greater length of the lower pair of branches.

The blunt-leaved variety *obtusum* proceeds to the other extreme, and has the leaflets large, broad, and undivided, with a notched edge.

Those who may possess a partiality for variegated foliage will find in the white streaked fronds of the form called *variegatum* something to suit their taste.

Mr. D. Stock has communicated to us an abnormal form, collected by him at Bungay, in which the leaf-stalk is divided about one-third of its length from the root-stalk, each branch bearing a frond similar in size and shape to the ordinary form.

Although this fern was formerly employed as a pectoral, it has now no reputation as a curative agent.

THE HART'S TONGUES.

Clusters of spore-cases in pairs, with a covering opening down the centre between them.

The only representative which we possess of this genus of ferns, is so common and so generally known, that very little description is necessary. The scientific name of *Scolopendrium* alludes to the "centipede," and is more fanciful than descriptive.

Although there is no fear of any one confounding the Hart's Tongue with other species, it is our duty to indicate the differences between the genus to which it belongs and its allies. In the Hart's Tongue Ferns the long clusters of spore-cases are arranged in pairs, which are closely placed side by side, covered through their whole length, at first by a membrane, which ultimately splits down the centre between the twin clusters, and exposes the brown spore-cases in long rusty rows. These rows are parallel in an oblique direction, proceeding from near the mid-rib towards the margin of the frond.

Though the single species is very much given to variation, it is the only species which is either indigenous or

cultivated, and probably is the only genuine species known.

HART'S TONGUE.*

The tufts of glossy, green, smooth and undivided fronds of this common fern, always renders it a favourite and indispensable companion of the lobed and feathery species in a fernery. The long, narrow, and almost strap-shaped fronds have acquired for this species in some localities the name of Seaweed Fern.

Sometimes 16 or 18 inches in length, but more commonly from 10 to 12, and from $1\frac{1}{2}$ to 2 inches in breadth. Stiff, and rather leathery in texture, with a rigid mid-rib, and a strong tough stipe or leaf-stalk. The very appearance of the fern indicates its hardy nature, and its capacity for maintaining its verdure through any ordinary winter. The under surface of the fronds bear the fructification in long rusty lines, proceeding in an oblique direction, on either side of the mid-rib, towards the margin. (Fig. 16.) Each of these lines consist of a double series of spore-cases, which are at first covered with a thin membrane; but which ruptures down the centre, between the twin clusters, and exposes the spore-cases as they attain towards maturity.

Found everywhere—on hedge banks, old walls, on the sides of wells, and in a variety of situations, accommodating itself to the various conditions in which it may be placed. Easily grown, and indispensable both to the outdoor fernery and the greenhouse. Small plants may be grown with effect in a closed case.

There are a great number of varieties of this fern, all of which are rare in the uncultivated state. A list of eighty-five named varieties lies before us, of which an enumeration could serve no useful purpose.

The crisped variety (*crispum*) has large crisped and waved fronds, resembling green frills. It is a well-known form under cultivation, but is said to be always barren.

* *Scolopendrium vulgare*, Sm.

The crested variety (*cristatum*) has the frond divided near the top, and each division again and again subdivided so as to form a bushy tuft.

Another interesting crested variety is called *digitatum*—for there really are no English names by which these varieties are known amongst cultivators—has branched and repeatedly forked fronds, which are flat and fan-shaped.

A number of other varieties are characterized chiefly by variations in the branching of the fronds.

A proliferous variety (*viviparum*) bears on the surface of the fronds numerous little miniature plants, which continue adhering to the skeleton as the frond decays. Three or four other varieties are proliferous, and one of these is called *proliferum*. These are rather striking forms for cultivation under glass, but rarely succeed well in open air.

The endive-leaved variety (*laceratum*) has the frond somewhat crested at the top, and the edge deeply cut into irregular lobes, the lowest pair of lobes being large and spreading.

The variety *rugosum* is a strange-looking stunted form with short ragged-edged fronds.

The broad branched form called *ramosum majus* is quite a curiosity, with its broad forked fronds, which are again divided near the extremity, and the points curved toward each other like a crab's claw.

The kidney-shaped or oval fronds of the form *abruptum* are sufficient to recommend this as a pleasing variety for those who desire to cultivate distinct and imposing varieties.

Minute differences in the manner of toothing at the edges of the fronds, of dividing or branching, of expanding or modifying the lobes at the base, of cresting at the summit, of diminishing or increasing the length of the frond, all give rise to varieties, better appreciated and understood by the professional cultivator than cared for by the amateur.

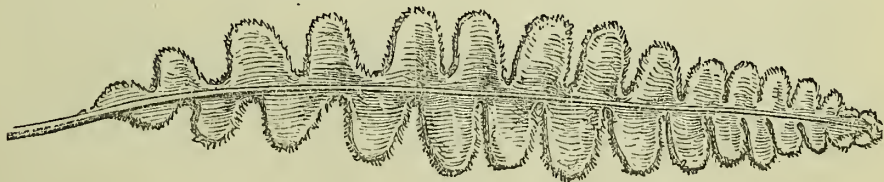
THE SCALE FERNS.

Spore-cases concealed amongst brown chaffy scales.

These are sometimes called "Rusty-backs," because the whole under surface of the fronds are of a rusty brown colour, from the numerous brown scales which cover them. The clusters of spore-cases are so imbedded amongst these chaffy scales, that it is often difficult to detect their presence. This is so conspicuous a feature in the Scale Ferns, that it is scarcely necessary for our present purpose to indicate any other point of difference between them and their nearest associates. Having to deal with British species, our only object is to indicate, in a plain and easy manner, how the unscientific person may learn to distinguish one from another, without being troubled with minute and delicate differences and technical distinctions. We possess but one indigenous Scale Fern, which bears amongst botanists the generic name of *Ceterach*, and which term is supposed to be a corruption of the name applied to it by old Oriental writers. It is far less suggestive than the less classical but more popular names of either Scale Ferns or Rusty-backs.

SCALE FERN.*

Sometimes called the Rusty-back, and sometimes the Scaly Spleenwort. So characteristic is it, and so well known, that description is almost unnecessary.



This fern grows in a close tuft from a short thick scaly root-stock. The entire length of the frond is from 4 to

* *Ceterach officinarum*, WILLD.

6 inches, rarely more and sometimes less. The outline of the fronds is narrowly spear-shaped, deeply notched on each side nearly to the mid-rib, so as to form a series of rounded lobes, which are generally entire, or smooth at the edge. The upper surface is of a deep dull green, and the under surface of a rusty brown, from the numerous brown scales which conceal the spore-cases, and which have originated the name of "Rusty-back." The texture of the fronds is thick and leathery, and many of them are persistent through the winter. The veins of the leaves branch and run into each other in a much more complicated and netted manner than in the majority of British ferns.

This fern is widely distributed, though there are probably many counties in which it is seldom or never seen. Old walls and ruins are its favourite localities, but it is sometimes met with in rocky places. It is perhaps most rare in the midland and eastern counties of England.

This is not an easy fern to cultivate. It never seems to succeed well in the Wardian case, and only occasionally in the open air. The best chance of success is secured by planting it in the chinks of an old wall, in a shady situation. In its natural state the aspect was north-east wherever we have observed it growing freely. The crown must always be so elevated that water will not settle around it; and to water it freely, especially on the crowns, ensures speedy death and decay. Its small size and peculiar appearance would render it quite an acquisition for the "case," if it could be induced to flourish in such a situation.

This fern had formerly a reputation in medicine, and the Arabs still believe in its potency. Amongst the drugs sent from Tunis to the Great Exhibition of 1851 was the Scaly Fern.

THE HARD FERNS.

Clusters of spore-cases in a line on each side of the mid-rib.

One of the words which the old Greeks employed to designate a fern was "*Blechnon*," and by altering this

word into "Blechnum," we have the most commonly accepted name by which scientific people recognize the Hard Ferns. Some say it should be "*Lomaria*." Who shall decide when botanists disagree? We will call them Hard Ferns. Along the back of the fronds, in these ferns, the spore-cases are arranged in a long, narrow, continuous line on each side of the mid-rib. This line has a covering in its early stages, but this covering soon splits down the side next the mid-rib, and the spore-cases appear to cover the whole under surface of the fronds. The Brackens most resemble the Hard Ferns in the fruiting; but even in them there is a marked difference, for the long lines of spore-cases surround the edges of the divisions of the fronds, leaving the space in the centre about the mid-rib clear and unoccupied. Moreover, the little tufts of glossy leaves in our one single species of Hard Fern can never be confounded with the tall branched fronds of our only Bracken. It may be as well to remember the different arrangement of the lines of spore-cases in these two groups, as there are hardy species, not natives of Britain, desirable for cultivation.

HARD FERN.*

The glossy, stiff, leathery fronds of this fern are of two kinds, produced in a dense tuft, with the barren fronds on the outside, the outer ones lying flat on the soil, and the fertile fronds erect in the centre. The average length of the barren fronds is between 6 and 12 inches, and of the fertile fronds nearly double that length. The outline of both kinds is narrowly spear-shaped. The barren fronds are deeply cleft on each side nearly to the mid-rib into narrow lobes; the fertile fronds are divided quite down to the mid-rib, but the lobes are narrower, and with a greater distance between them. The stalk of the barren fronds is very short, whilst that of the fertile fronds is nearly half the length of the entire frond. The spore-

* *Blechnum spicant*, Sw.

cases form a narrow line on each side of the mid-rib of the lobes of the fertile fronds. (Plate X., fig. 2.)

This is rather a common plant on heaths, in woods, on rocky hills, &c., evidently preferring the neighbourhood of water. When not much exposed, some of the fronds will remain green through the winter.

The Hard Fern will grow readily on rock-work in the open air, if placed under favourable conditions for moisture, and small specimens will often succeed in a "case;" but the open air, or in pots in a cool shady greenhouse, are the most desirable conditions.

This fern had in olden times some repute as a medicine under the name of Rough Spleenwort. Gerarde, however, writes of it with less faith than was his wont. "There be empiricks or blinde practitioners of this age, who teach, that with this herbe not onely the hardnesse and swelling of the spleene, but all infirmities of the liuer also may be effectually and in very short time removed, insomuch that the sodden liuer of a beast is restored to his former constitution againe, that is, made like unto a raw liuer, if it bee boyled againe with this herbe. But this is to be reckoned among the old viues' fables, and that also which Dioscorides telleth of touching the gathering of spleenwort in the night, and other most vaine things, which are found here and there scattered in old books, from which most of the later writers do not abstaine, who many times fill up their pages with lies and frivolous stories, and by so doing do not a little deceive young students."

The Alpine Hard Fern, which some have regarded as a distinct species, under the name of *Blechnum alpinum*, seems to be no other than a stunted mountain variety of this same fern.

The usual variations reappear in this fern, and we have consequently a list of nearly twenty Latin names, which are supposed to represent as many modifications of this species.

The crested form (*ramosum*) has diminutive fronds, which are closely and shortly divided and subdivided at the apex, so as to form a kind of lunar crest.

In *trinervum* a pair of leaflets, resembling small fronds of 2 or 3 inches in length, diverge at nearly right angles from the mid-rib at the base, occupying the place of the lowest pair of lobes. This singular proclivity gives a very characteristic appearance to the fronds.

The variety *heterophyllum* has not much to recommend it, the lobes are exceeding variable in size and form in the barren fronds, which look as if they might have been nibbled into irregularity by some marauding rabbit.

The branched forms have a representative in the variety *multifidum*, which has the fronds forked two or three times; and in another variety the side lobes of the fronds are also forked at their tips.

For the cultivation of this fern and its varieties, a mixture of loam and peat is usually recommended; but soil does not appear to influence its growth so much as plenty of air, shade, and moisture.

THE BRACKENS.

The entire edge of the fronds bent back and covering the spore-cases.

So many words employed in connection with ferns are compounded of the Greek "*ptēris*," which is used as the scientific name of the Brackens, that it is quite essential for us to understand what "*ptēris*" means. Its original meaning was undoubtedly "a plume" or "feather." Afterwards, perhaps, it became associated with such ferns as have a plumose or feathery appearance, and we are occasionally told that "*pteron*" was the Greek for "a fern," as if it never had any other meaning. One who studies ferns is called a pteridologist, and we have countless botanical names, generic and specific, applied to ferns, compounded of the ubiquitous *ptēris*.

This is the only genus of the British ferns in which the spore-cases are arranged in a single narrow line along the edge of the frond, with the margin of the frond curled backwards so as to form a covering. The centre of all the divisions of the frond on each side of the mid-rib is bare,

whereas in the Hard Ferns the line of spore-cases occupies the space on each side of the mid-rib.

There is but one native species of Bracken, which compensates for its limitation in this respect by being almost unlimited in individuals. Indeed, we would hazard the assertion that, could they be counted, there are as many plants of the common Bracken in the three kingdoms as of all the other species of ferns together.

BRACKEN.*

The common Brake or Bracken grows from 3 to 6 feet in height under ordinary circumstances, but Mr. Sowerby mentions one which he measured, found growing near Hampstead Heath, that was 13 feet long. The root-stock is creeping, of a dark brown colour, and velvety. The fronds arise at intervals from the root-stock, and are dark coloured at their lowest extremity, which is covered by the soil. The upper portion of the fronds is branched, the branches being produced in pairs. Each of these branches also produce secondary branchlets, which bear long feathery leaflets, cut on each side into lobes nearly to the mid-rib. The whole frond is very compound, or much divided and subdivided. The stem, if cut transversely, exhibits a curious arrangement of the dark woody bundles, which has been supposed to resemble a spread eagle; the Latin name for "eagle" being *aquila*. From this circumstance the botanical name of "*aquilina*" given to this species is undoubtedly derived. The spore-cases are produced at the edge of the ultimate subdivisions of the frond, as already indicated. (Plate X., fig. 1.)

This is generally admitted to be a difficult plant to transplant and cultivate successfully,—a circumstance of less importance when it is remembered that there are very few situations in which it would be regarded as an acquisition—perhaps only in a shrubbery.

Not very long since (1865) the editor of the "Field "

* *Pteris aquilina*, LINN.

gave to a correspondent the result of his experience in the cultivation of this fern: "Bracken grew naturally in such glorious health and profusion where we were then located, that we thought, on having a piece of ground lying idle which we wanted to make into a canal, it would be the easiest thing imaginable to dig up a lot of underground roots (rhizomes), and plant it without any more ado. Accordingly we put this plan into execution: but the result was exactly as we were foretold by a long-headed old gardener, that not fifty per cent. of the roots grew, and the place looked the mangiest piece of ground you ever saw. We then took counsel with our old gardener friend, who said that to grow Bracken at the first start required as much preparation of the soil as for a crop of potatoes. The covert is everything that could be wished now, and this is how we proceeded: We had the ground well dug early in the winter, to get it well moulded by the frost. In March we took up as many of the underground stems (rhizomes) as we wanted, we drew out drills about 2 inches deep, and, about a yard apart, laid the rhizomes in the drills pretty thickly, and covered with soil. We kept them clean from weeds for the first year, and watered those plants which required it."

This fern is very astringent, containing much tannic and gallic acid, and has been used as an anthelmintic. Lightfoot gives a full account of the many uses to which it has been applied. He says, "It is an excellent manure for potatoes, for, if buried beneath their roots, it never fails to produce a good crop. Its astringency is so great that it is used in many places abroad in dressing and preparing kid and chamois leather. In several places in the North the inhabitants mow it green, and, burning it to ashes, make those ashes up into balls with a little water, which they dry in the sun, and make use of them to wash their linen instead of soap. In many of the western isles the people gain a very considerable profit from the sale of the ashes to soap and glass makers. In Invernesshire we observed that the people thatched their houses with the stalks of this fern, and fastened them

down with ropes made either of birch bark or heath. In some parts of Normandy we read that the poor have been reduced to the miserable necessity of mixing the roots with their bread; and in Siberia and some other Northern countries the inhabitants brew them in their ale, mixing one-third of the root to two-thirds of malt. The ancients used the root and whole plant in decoctions and diet drinks in chronic disorders of all kinds. The country people still continue to retain some of its ancient uses, for they give the powder of it to destroy worms, and look upon a bed of the green plant as a sovereign cure for the rickets in children."

We have already alluded to the use of this fern in packing fruit, to which we may add that Johnston remarks in his "Flora" of its applicability for packing apples for winter keeping. Apples preserved in straw, sawdust, &c., uniformly contract a taint or flavour from the straw, the paper, or the wood; but a layer of Bracken and a layer of apples may be four or five times alternated, without the least risk of taint for three months. The boxes so packed and covered with a lid were placed on a dry bank close by a wall, and covered up with straw and earth. The apples kept plump and quite untainted. In Ireland, it is said that the fronds of the Lady Fern are employed for a similar purpose.

In an early part of this volume we have alluded to the parasites which develop themselves upon the Bracken, the most interesting of which is perhaps that which occurs in little black patches on the under side of the leaflets, and which is mentioned again here to caution the inexperienced against falling into the error of regarding them as a form of the fructification of the fern.

MAIDENHAIR.

Lobes at the edge of the leaflets bent back over the spore-cases.

It is many years ago that our curiosity was excited amongst a rural population in the east of England to hear the Maidenhair constantly alluded to as a beautiful plant

that grew on a certain spot, and was collected by the villagers for decorative purposes. It was not a likely locality at all for the Maidenhair Fern, and we became anxious to discover what it could be which in the local Flora usurped the name. Suffice it to say, that at length the Quaking Grass (*Briza*) was indicated as the Maidenhair. There is certainly some reason in applying to one of the prettiest of grasses the name of one of the loveliest of ferns. Making poetical allowances, there is also some resemblance between the two.

The name *Adiantum* (dry) is of Greek origin, and the group which bears it is distinguished by having the tufts of spore-cases borne on the under surface of the fronds, near the edge, with the lobes or projections of the leaflets bent back, so as to form a covering to the clusters of spore-cases. These clusters do not form continuous lines round the edges of the fronds, nor is the whole margin bent back, as in the Brackens.

There are many species of Maidenhair, or *Adiantum*, scattered over the world, but only one species, and that not commonly, is found in the British Isles. This species has a wide range, being found in the tropical and temperate regions of both hemispheres.

MAIDENHAIR FERN.*

The fronds of this fern are usually 8 or 10 inches in length, sometimes more, exceedingly graceful, and very much subdivided. They consist for half their length of a blackish stalk, which then divides into numerous branches, which subdivide until at last they are only like a horse-hair, black and shining, bearing at their nodding and vibrating extremities the green leaflets. These leaflets are fan-shaped, cut into lobes at their outer and rounded edge. The lobes of the leaflets are bent back to serve as a covering to the clusters of spore-cases, which are borne, at the outer edge, on the under surface of the leaflets. (Plate XII., fig. 1.)

* *Adiantum capillus-veneris*, LINN.

This is a southern species, being found only in the warmer parts of the British Isles. It will not succeed in the open air, but will thrive in a greenhouse or Wardian case. In a heated fernery it will flourish luxuriantly and produce plenty of young plants.

Ray, on the authority of a Montpellier physician, attributes every possible virtue to this fern, notwithstanding which its use is quite obsolete in medical practice. It is slightly astringent, and is said to have entered into the composition of the beverage called "capillaire," though it is doubtful whether now-a-days any portion of the Maidenhair Fern enters into its composition.

It was stated at a meeting of the Natural History Society of Dublin that this plant grows abundantly in the limestone districts of Burren, in the county of Clare, and in the Arran Islands, Galway Bay, and that it has been found on clay-slate in the county of Leitrim, and on old red sandstone, Cahir Conree Mountain, Kerry ; thus accommodating itself to various geological formations. The plants of Burren seem peculiar to that district, and are said to be identical with the *Adiantum Africanum*, described by Robert Brown as found in the island of Goletta, in the Mediterranean, and on the African coast. They differ materially in growth from those of the South Europe and specimens from Cornwall.

BLADDER FERNS.

Clusters of spore-cases with a covering resembling a hood.

The name by which this genus of ferns is known to botanists is *Cystopteris*, which being translated into plain English, simply means "Bladder Ferns." Why they are so designated seems to have originated in the form of the covering to the clusters of spore-cases. This covering is attached beneath the tufts and expands over them like a hood, a feature which distinguishes these from all other of our native ferns. In external appearance they may easily be confounded with ferns belonging to other groups

or genera; but if care be taken to examine the form of the covering before jumping to a hasty conclusion, no mistake is likely to be made. They are exceedingly delicate and fragile in their nature, and are therefore sometimes called Brittle Ferns. The three indigenous species are:

BRITTLE BLADDER FERN. — Fronds spear-shaped, branched in a feathery manner; leaflets notched at the margin;

ROYAL BLADDER FERN. — Fronds spear-shaped, branched in a feathery manner; leaflets deeply cut into lobes;

MOUNTAIN BLADDER FERN. — Fronds triangular, branched; the branches bearing smaller secondary branches, on which are the leaflets (*tri-pinnate*).

BRITTLE BLADDER FERN.*

This is the most common of the Bladder Ferns, and grows in tufts sometimes nearly a foot high, though usually about 6 or 8 inches. The foot-stalk is very brittle, and is bare through half its length, except a few scattered scales at the base. The outline of the leafy portion is spear-shaped. The branches are usually at some distance apart, though in one or two varieties crowded together. The outline of the branches is gradually tapering outwards, and the leaflets are of a long egg shape, deeply cut into narrow lobes, or notched at the edges. The tufts of spore-cases are often numerous, rounded, and at first distinct; but by spreading till they meet each other, the under surface of the fronds occasionally appears to be completely covered with the spore-cases. (Plate XI., fig. 2.)

It is not an uncommon circumstance for the under surface of this fern to be sprinkled with the orange pustules of a kind of parasitic fungus, to which we have already alluded.

The Brittle Bladder Fern is found in moist rocky situa-

* *Cystopteris fragilis*, BERNH.

tions in the mountain districts of Great Britain. It is a very easy fern to cultivate, and will grow freely in common garden mould in the open air, or in pots in a greenhouse. We have introduced it into a closed case, but its attenuated and sickly appearance in such a situation seems to indicate that it only occupies room which many another species would fill with greater satisfaction.

The most distinct variety of this fern is the one which bears the name of Dr. Dickie, Professor of Botany at Aberdeen, near which place it was first found. It has a compact habit, the branches being so close that their edges overlap, and the leaflets are rounder and more closely set than in the typical form.

There is also a toothed variety (*dentata*), in which the edges of the leaflets are notched all round into a border of short teeth.

ROYAL BLADDER FERN.*

This is sometimes called the Alpine Bladder Fern, and produces its fronds in tufts of from 4 to 7 or 8 inches in length. The outline of the fronds is spear-shaped, with a short stalk, a little scaly, at the base. The frond is divided into six or seven pairs of branches, which latter have a narrow leafy edge or wing. Each branch is nearly at right angles with the stalk, and diminishes outwards, so as to be of an elongated triangular outline. The leaflets are small and deeply cut into narrow lobes, which are occasionally notched. The tufts of spore-cases are rounded and placed near the edges of the leaflets.

This is one of those very rare species, regarding which doubts are often entertained as to the desirability of continuing to regard them as British. The present species was found on an old wall at Low Leyton, but in the south of Europe it affects mountainous stations

A good reputation is given to this fern under cultivation. It is said to succeed well out of doors or in a greenhouse, but to be impatient of confinement in a

* *Cystopteris alpina*, DESV.

closed case. Under no condition have we at present tested its qualities.



MOUNTAIN BLADDER FERN.*

This fern has a slender, creeping root-stock, from which the fronds do not often rise more than 5 or 6 inches. The general outline of the frond is triangular, with branches proceeding on either side from the stalk of the frond. The lowest pair of branches are nearly as long as the leafy portion of the frond, but those above them diminish rapidly in length towards the end of the frond. The branches,

* *Cystopteris montana*, BERNH.

again, bear smaller branchlets on either side, but considerably the longest on the lower side, and on these are arranged the coarsely-toothed leaflets. Towards the apex of the branchlets, the branches, and the frond itself, the form becomes more and more simple. (Plate XI., fig. 1.)

The texture of the frond is very delicate, resembling more the leaves of some such plant as parsley, or chervil, than ordinary fern-leaves. This feature is partaken by all the Bladder Ferns, and were it not for the peculiar veining of the leaves, and the rusty spore-cases on the under surface, it is quite possible for them to be passed by as doubtful by those not much accustomed to look after ferns.

The only localities which we have heard of for this fern in Great Britain are the Clova and Breadalbane Mountains, in Scotland.

This plant may be grown out of doors in a sheltered situation, and protected with a bell-glass till firmly established, taking care that it does not become dry. We have never had the opportunity of trying this plant in a closed case, but should have some doubt of success, as neither of the Bladder Ferns already described are recommended for confinement.

THE WOODSIAS.

Clusters of spore-cases sealed in a cup-shaped receptacle, with fringed edges.

The name of *Woodsia* was given to this group of ferns in honour of an English Botanist, Mr. Joseph Woods, and being easier of remembrance and more popular in its character than the majority of botanical names, gives no excuse for applying or originating any other name.

The *Woodsias* are pretty little ferns, with the tufts of spore-cases scattered over the backs of the fronds. At first the clusters of spore-cases are wholly enclosed in a membrane, which constitutes the covering, or indusium. Afterwards this membrane ruptures at the apex and exposes the spore-cases. The tooth-like fragments of the

cover fall back, and appear like a fringe around the base of the clusters of spores. A covering of this nature is not present in any other group of British ferns, and is sufficient for its discrimination. The leaf-stalks are jointed at a short distance from the root-stock, and at this joint or articulation the old fronds separate from the stock — a peculiarity confined to the Woodsias amongst British ferns.

The two British species of Woodsia may be distinguished by the following characters:

ALPINE WOODSIA.—Fronds narrow, nearly smooth, leaflets almost triangular;

HAIRY WOODSIA.—Fronds spear-shaped, hairy leaflets, oblong.

ALPINE WOODSIA.*

This little Woodsia grows in tufts seldom more than 2 or 3 inches in height, and naturally in almost inaccessible places. The outline of the fronds is narrowly spear-shaped, almost strap-shaped. They consist of a stalk bearing on each the somewhat bluntly triangular leaflets: these leaflets have a distance between them equal to the width of a leaflet, and they do not stand exactly opposite to each other in their arrangement up the stalk. The leaflets are closer together at the top than at the bottom of the fronds. This species is scarcely hairy; it is indeed smooth as compared with its fellow, the Hairy Woodsia. A few scaly hairs are sprinkled over the surface of the fronds, but these are more resembling scales than hairs. The tufts of spore-cases are produced freely on the backs of the leaflets. Surrounded by the fringed edge of the ruptured covering, they present an appearance sufficiently distinct for the identification of the genus.



* *Woodsia hyerborea*, R. Br.

And this species may be known from the Hairy Woodsia not only by the narrower fronds, but also by the shorter leaflets, and their smoother surface. Some persons regard the one as a variety of the other; but whilst it must be confessed that ferns are exceedingly variable, there appears to be no good reason for associating these two together as forms of the same species.

This rare species is only found in the clefts of rocks in high and almost inaccessible mountain districts.

HAIRY WOODSIA.*

Whether we call this the Hairy Woodsia or the Oblong Woodsia is of very little consequence, since both these names indicate a point of difference between the present and its companion species.



The little tufts of this fern seldom exceed from 2 to 4 inches in height, dying down to the ground in the autumn, and being replaced in the spring. The outline of the fronds is spear-shaped. The leaf-stalk, which is rather scaly, bears on opposite sides, and in pairs, one opposite to the other, the oblong leaflets. These leaflets are about twice as long as broad, deeply cut at the edges into five or six lobes. Both surfaces of the fronds are sprinkled with bristly hairs, which are often so plentiful on the under surface as nearly to conceal the spore-cases. The greater breadth of the fronds, more elongated leaflets, and hairy surface, are features whereby to distinguish this from the Alpine Woodsia.

Like its companion species, this is only found in scarcely accessible and elevated mountain stations. Many persons suppose that both these ferns are difficult to cultivate.

* *Woodsia ilvensis*, R. BR.

We have been assured that such is not the case, and that they will succeed in pots in a greenhouse, if not exposed to sunshine, if well drained, by filling one-third of the pot with drainage material, and if the soil is never allowed to become quite dry.

THE FILMY FERNS.

Spore-cases enclosed in a two-valved receptacle, which is borne on the edge of the fronds.

There is always an interest associated with the little Filmy Ferns. Their delicate texture, local distribution almost equal to rarity, diminutive size, singular mode of fruiting, retiring disposition, and, until recently, unsuccessful cultivation, have all helped them to notoriety. Botanists have constituted for these ferns and their allies a special sub-order, and with them also they are plants of interest. The generic name of *Hymenophyllum* is of Greek origin, and means literally "membrane-leaved." One point of structure in which these ferns differ from all the species enumerated, possessed with a ring to the spore-cases, is, that the ring in both the Filmy Ferns and the Killarney Fern passes round the spore-case in an oblique manner instead of being vertical. It is on this account that a special sub-order has been set apart for their reception. The principal points of difference between the Filmy Ferns and the Killarney Fern are found in the form of the kind of receptacle which contains the spore-cases. In both instances the spore-cases are produced at the edge of the frond, and in both the spore-cases are enclosed in a kind of capsule or receptacle. In the Filmy Ferns this receptacle is two-valved, and in the Killarney Fern it is cup-shaped and entire. The singular appearance of this kind of fructification is calculated to puzzle the beginner, and cause him to wonder whether such can really be ferns.

These little plants are so diminutive that they are almost as much like mosses as ferns to the uninitiated, and the delicate texture of the leaves serves to strengthen such

an impression. They delight in clefts and shady nooks, growing on the face of rocks exposed to the spray of waterfalls, or dripping with moisture, and even whilst growing look as little like ferns as possible. There are numerous species found in temperate and tropical regions, the East and West Indies, North and South America, Tasmania, and New Zealand.

The two British species are sometimes found growing together, but more commonly in distinct localities. They are very much alike, but are distinguishable by the following characters :

TUNBRIDGE FERN.—Receptacle containing the spore-cases flattened, and toothed at the edge.

WILSON'S FERN.—Receptacle swollen, *not* flattened, and smooth at the edge.

TUNBRIDGE FILMY FERN.*

The rapacity of fern collectors has left very little of this interesting fern to flourish at Tunbridge Wells, on the old station from whence its name is derived.

Like its fellow, the black wiry root-stock entwines and forms a dense network over the damp rock on which it flourishes, and from these the filmy fronds rise to the height of 3 or 4 inches, often not much more than 2 inches, in a large dull green patch. The form of the outline of the frond is almost spear-shaped, with more compound leaflets than in Wilson's Fern: here they are divided and subdivided so as to resemble branches and branchlets of the tough black leaf-stalk, with a narrow band of filmy green along each side. The receptacles which contain the spore-cases are urn-shaped, and produced at the edges of the fronds. The spore-cases are arranged about a central column, which stands up in the receptacle. One point of difference between the Tunbridge Fern and Wilson's Fern is that in the former, the two portions or valves into

* *Hymenophyllum Tunbridgense*, SM.

which the receptacle divides is jagged or toothed at the edge, whilst in the latter the margin is smooth.

On rocks which are continually moist, or subject to the spray of waterfalls. Not uncommon in rocky or mountainous districts.

These little ferns require a special mode of cultivation by themselves, and if the conditions are complied with they will succeed. Last year we collected a tuft of



Wilson's Fern, about the size of the hand, at the Swallow Falls (well known to every Welsh tourist), and placed it on a flat piece of porous sandstone, tying it in position with black thread. The sandstone was placed in a common glazed pan, and water poured in to the depth of half an inch, then a bell-glass was placed over all, and it stood in a cellar for two months without being looked at. It was then taken out, uncovered, found to be damp and healthy; a little water was sprinkled over the fronds, more water put in the pan, and the glass replaced. The whole was now placed under a flower-stand in a gloomy corner of a greenhouse, where it continues to flourish. All the moisture necessary for its growth percolates through the sandstone, or is derived from the moist atmosphere by which it is continually surrounded. If no shady

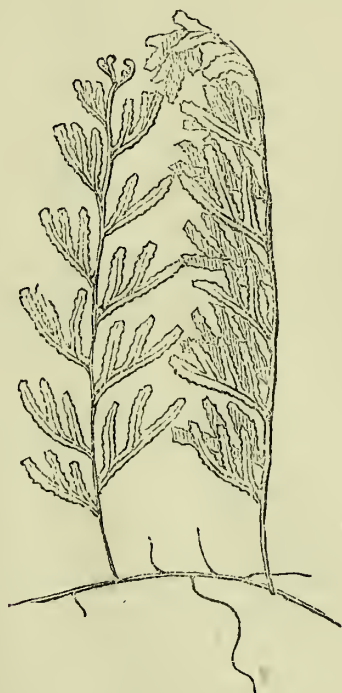
place can be secured for growing the Filmy Ferns, the glass which covers them should always be shaded by throwing a piece of muslin over it. It is an advantage to have a hole drilled through the top of the hand-glass, and stopped with a peg of soft wood, which can easily be removed for ventilation. When not grown upon slate or sandstone, the following mixture is recommended: Fibrous peat, a little silver sand, and some bog moss or *Sphagnum* made quite dry, and rubbed into powder. This to be mixed with pieces of charcoal, and placed on the top of drainage material, which should occupy the lower half of the pot. The plants to be secured on this mixture and covered with a bell-glass. The pot to be kept in a glazed pan, and stood in a very shady place.

WILSON'S FILMY FERN.*

The One-sided Filmy Fern, or, as sometimes called, Wilson's Filmy Fern, has a small creeping wiry root-stock, and from the interwoven mass of these, the fronds arise in a large green patch, sometimes 3 or 4 feet, or more, in extent. The average height is not more than from 2 to 4 inches. The upper portion of the tough, dark-coloured leaf-stalk has a membranaceous expansion or narrow wing on either side. The outline of the frond is narrowly spear-shaped. The leaflets are arranged in a feathery manner on each side, but as they are all turned towards one side, this has been designated the One-sided Filmy Fern. The outline of the leaflets approaches a wedge shape, deeply cut down from the apex into long narrow lobes, like the outspread fingers of a tiny hand. The texture of the leaflets is filmy and delicate, of a dull olivaceous green, the tops of the fronds generally curved over to one side. The clusters of spore-cases are contained in urn-shaped capsules on the edge of the leaflets, each of such capsules having a central projecting stalk or little column standing up in its centre, around which the

* *Hymenophyllum unilaterale*, WILLD., or *Hymenophyllum Wilsoni*, HOOK.

spore-cases are attached. The receptacles or capsules are *not* at all flattened, and consist of two valves, the edges of which are smooth, and *not* toothed or jagged. The



characters which separate this species from the last are not such as will be at once appreciated by the unscientific.

BRISTLE FERNS.

Spore-cases contained in an urn-shaped receptacle, which is borne on the edge of the frond.

The Bristle Ferns are closely allied to the Filmy Ferns in structure, appearance, and habit. In both, the fruit is borne at the edge of the frond in certain special receptacles. In both, the veins of the leaves are prolonged into a kind of columella, or little column, which stands up in the middle of the receptacles, and in both the spore-cases are attached to this column. But in the Bristle Ferns the column is lengthened out so as to extend like a bristle beyond the mouth of the receptacle, giving a

bristly appearance to the fronds, and from this appearance the name is derived. The generic name, *Trichomanes* (derived from the Greek), has a similar meaning. One other feature must be noticed in which the Bristle Ferns differ from the Filmy Ferns, which is, that the receptacle in the former is entire and undivided, whilst in the latter it separates into two valves.

There are also numerous species of Bristle Ferns growing in temperate and tropical regions, in similar localities to the Filmy Ferns.

Only one species is recorded in the British Isles, and this of rare occurrence. Indeed, it is one of the rarest of British Ferns in an uncultivated state.

KILLARNEY FERN.*

The black, wiry, creeping root-stock of this Fern is scaly. The rather drooping fronds are about 6 to 9 inches in length, proceeding at intervals from the root-stock. The leaf-stalk has a kind of membranaceous keel or wing on each side, and numerous branches; these branches bear the deeply cut and narrowly lobed leaflets. The outline of the fronds is rather variable, sometimes angular, almost elongated, triangular, at other times nearly spear-shaped, with somewhat of a crisped and "parsley"-like appearance, except that the texture of the leafy portion is thinner, more delicate, and of a much less vivid green. The receptacles which contain the spore-cases are produced on the margins of the leaflets, and differ from those of the Filmy Ferns in *not* splitting into two portions or valves. The central column of the receptacles extends beyond the outer edge like a bristle. The length varies very much under different circumstances. (Plate XII., fig. 2.)

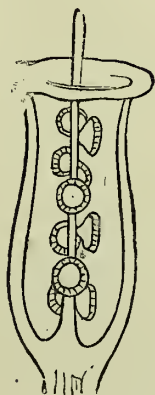
On dripping rocks, beneath the spray of waterfalls. Confined to Ireland. We have heard it affirmed to have

* *Trichomanes radicans*, Sw.

been found in North Wales, but could never make assurance of the truth of the allegation.

Similar treatment is necessary for the cultivation of this fern as recommended for the Filmy Fern, except that it will bear more light, but *not* sunshine.

The following method has been found to succeed for growing this fern in a room: A flat-shaped ornamental vase is covered at the bottom to the depth of 2 inches with "crops," or fragments of porous stone; the sides of the vase are surrounded with the same material, intermixed with moss and cocoa-nut fibre, for 2 inches in thickness. The centre is to be occupied with fibrous bog mould and sand, on which the fern is to be planted. A hand-glass should then cover the fern and the soil immediately around it. All moisture is supplied through the moss and cocoa-nut fibre at the edge, which is to be kept constantly wet. Under the same conditions and treatment a foreign fern called *Todea pellucida* may also be cultivated.



EXOTIC FERNS.

As an appendix to this little book we have ventured to give a list of exotic ferns which may be cultivated with advantage. Some of these are sufficiently hardy to be grown out of doors, some require to be protected from the extremes of our climate by cultivation in a greenhouse, whilst others are best adapted for growing in closed cases. We have given the average length of the fronds to serve as a guide to the quantity of room required for their successful cultivation, and in each instance it is stated under what conditions the respective plants should be grown. It is no less strange than true that a large number of exotic species have from time to time been introduced into this country which are easy of cultivation and do not require artificial heat; yet very few are ever seen in garden, greenhouse, or fern-case, except in large establishments where a gardener is kept, who is supposed to know everything, and grow everything, capable of producing a green leaf.

RED SCALE FERN (*Nothochlæna Marantæ*). This is a most interesting species for a "case" or greenhouse, and is easy of cultivation. The fronds but little exceed 6 or 7 inches in length, narrow, with blunt oblong leaflets on each side of the leaf-stalk. The under side of the leaflets covered with reddish scales. It is a native of the south of Europe, &c.

WOOLLY CLOAK FERN (*Nothochlæna lanuginosa*). This delicate and elegant little fern is scarcely more than 6 inches in height. The whole plant is woolly with hairs, and the under surface is of a brownish colour. The leaflets are small and three-lobed. It is a native of Northern Africa, Southern Europe, &c., and very tender, but with care might be cultivated in a Wardian case.

RUDDY CLOAK FERN (*Nothochlæna vestita*). This is also a woolly species, with a delicate habit, striking appearance, and suitable for a "case." The fronds are little above 6 inches in length, of a ruddy tint, in form re-

sembling the British "Hairy Woodsia." It is easily cultivated, and worthy of attention. Native of North America.

HAIRY CLOAK FERN (*Nothochlaena distans*) is a rare evergreen fern, suitable for a Wardian case. The whole plant is very scaly. The fronds are from 6 to 8 inches in length, narrow, with nearly triangular deeply-lobed leaflets on each side of the leaf-stalk. The leaflets are hairy, and the whole appearance attractive. It is an Australian species not often to be procured.

MARTEN'S GOLD FERN (*Gymnogramma Martensii*). The Gold and Silver Ferns, though very elegant and attractive, are very tender, and require artificial heat. The present species is more hardy than the generality, and has been recommended for the Wardian case or warm greenhouse, but we cannot speak from experience of the result. This fern is a native of South America, and one of the most golden of the Gold Ferns, the under surface of the fronds being densely covered with a rich yellow meal.

SIX-ANGLED POLYPODY (*Polypodium hexagonopterum*). This hardy fern is a native of North America, and is sufficiently distinct from either our Beech or Oak Fern to render it a desirable species for cultivation. The somewhat triangular fronds are from 12 inches in length, and though large for the generality of Wardian cases, it will thrive in a greenhouse.

BILLARDIERE'S POLYPODY (*Polypodium Billardieri*) is an Australian fern which will flourish well in a greenhouse. The evergreen fronds are about 12 inches in length, proceeding at intervals from a creeping root-stock. Some of the fronds are undivided, others are lobed in a similar manner to the common Polypody.

FORTUNE'S POLYPODY (*Drynaria Fortuni*). The bright green fronds of this species are strap-shaped and undivided, and about 10 or 12 inches in length, proceeding at intervals from a creeping root-stock. It is a native of China, and will succeed in a greenhouse.

The OSTRICH FERN (*Struthiopteris Germanica*). This splendid hardy fern is not half so well known as it deserves to be. The erect pale green fronds from 18 inches to 3 feet in height, are arranged like the feathers in a shuttlecock. The fertile fronds have a different form to the barren fronds, and do not appear till the summer, whilst the barren ones are developed early in spring. It is a thoroughly hardy species, and deserves a place in every outdoor fernery.

The HALBERT FERN (*Arthropteris filipes*) is a little evergreen species suitable for a "case," with a long, thin, creeping root-stock, from which the fronds rise singly, at short distance apart. The fronds are halbert-shaped, with a pair or more of rounded lobes at the base, the whole length being about 3 or 4 inches. It is a New Zealand fern, and may be grown in a greenhouse or a case.

The ORIZABA POLYPODY (*Polypodium affine*) is very little known, and although too large for a Wardian case, it will succeed very well in a greenhouse. The fronds are from 12 to 18 inches in length, and consist of about four pairs of spear-shaped leaflets and an odd one at the end. Each leaflet is 2 or 3 inches in length, perhaps more, deeply notched at the edges. The foot-stalk is comparatively long.

The SICKLE POLYPODY (*Polypodium trepanum*) is a Madeira species suitable for a greenhouse. It is a large and elegant evergreen fern, with a triangular outline, and sickle-shaped leaflets, arranged in a feathery manner on the branches, each leaflet being sharply toothed. Its appearance is very much that of a Shield Fern.

PURPLE AMERICAN FERN (*Platyloma atropurpurea*). Although not sufficiently hardy to bear our winters out of doors, this is nevertheless a useful fern, easy of cultivation in a light soil, with good drainage and not too much water. The fronds are 6 or 8 inches in length, light and graceful, and suited for a Wardian case.

CAPE HALBERT FERN (*Platyloma hastata*) may be cultivated in a greenhouse. The evergreen fronds are upwards of a foot in length, with a jasmine-like appearance, and of a pale green. It is not an uncommon species, and is easily propagated from spores.

AUSTRALIAN BRACKEN (*Pteris umbrosa*). The fronds are cut into long, narrow-pointed leaflets, which have a drooping habit, and render this one of the prettiest of Brackens. The fronds are from 2 to 3 feet in length, hence this fern is only suitable for greenhouse cultivation.

SAW-LEAFED BRACKEN (*Pteris serrulata*) is one of the commonest foreign ferns in cultivation, and though generally called a stove fern, it grows well either in a greenhouse or a Wardian case. Having stood the winter of 1866-7 in such a situation with us, we can confidently recommend it as one of the most useful of exotic species. Although a native of the East Indies and China, it by no means requires artificial heat to cause it to flourish, and is very easy to manage.

SHARP-TOOTHED BRACKEN (*Pteris arguta*). This is a large and commonly cultivated greenhouse fern, with fronds upwards of 3 feet in length. It is a native of Madeira and other neighbouring islands

BAT-WINGED BRACKEN (*Pteris vespertilionis*). Another large and elegant evergreen greenhouse fern, with much divided fronds, 3 feet long. This requires room as well as the last, from which it differs greatly in appearance, though both are equally handsome. Native of New Zealand.

TREMBLING BRACKEN (*Pteris tremula*) also has fronds 3 feet in length, is elegant in habit, and besides being an evergreen, is easy of cultivation. So freely does this species grow from spores, that it may easily become a pest in a greenhouse, unless the seedlings are kept in check. It is an Australian species, but not hardy enough for the outdoor fernery.

SLENDER BRACKEN (*Pteris scaberula*). This is exceedingly graceful and delicately cut. The fronds but little exceed a foot in length, divided and subdivided in a very compound manner into narrow leaflets. It is a native of New Zealand, suitable for a greenhouse, and a desirable fern for a large closed case.

SIBERIAN SILVER-LEAF (*Cheilanthes argentea*). This beautiful little fern does not reach more than 4 or 5 inches. The fronds are of a triangular outline, deeply notched, and supported upon a long foot-stalk. The upper surface is dark green, the under surface white with a mealy powder. It is evergreen, and may be cultivated in a case or greenhouse.

BROWN AMERICAN FERN (*Cheilanthes micromera*) is easily cultivated in a greenhouse or Wardian case. The fronds are from 10 inches in length, narrowly spear-shaped, and branched in a feathery manner, with a brown, hairy leaf-stalk. Native of the warmer parts of America.

ALABAMA FERN (*Cheilanthes Alabamensis*) is smaller than the last, and more hardy. The fronds are not more than 4 or 5 inches in length, with a glossy black leaf-stalk, and the plant may be cultivated in a Wardian case.

FRAGRANT MADEIRA FERN (*Cheilanthes fragrans*). This fern is not confined to Madeira, but occurs in the south of Europe and in Asia. The fronds attain about 6 inches, are of a light green, and evergreen. Although requiring care, it will flourish in a case or greenhouse.

HAIRY CAPE FERN (*Cheilanthes hirta*). Varying from 7 or 8 to 14 or 15 inches in height; variable in the form and arrangement of the leaflets; not difficult to manage in a greenhouse, and with a graceful, attractive habit.

SIEBER'S FERN (*Cheilanthes Sieberi*). This is a very graceful little species for a case, with fronds not exceeding 6 inches in length, but, unfortunately, it is very

scarce and but little known. It is a native of Australia and New Zealand.

CHERVIL FERN (*Cheilanthes multifida*). The fronds are triangular, and about 6 inches in length; it is also uncommon. This is a Cape species, and requires to be grown either in a warm greenhouse or a closed case.

PREISS'S FERN (*Cheilanthes Preissiana*) is an Australasian species, with narrow attenuated fronds, a foot in length, suitable for a greenhouse.

ROUGH DOODIA (*Doodia aspera*). An evergreen fern, with spear-shaped, feather-lobed fronds near a foot in length, and may be cultivated in a greenhouse.

TAILED DOODIA (*Doodia caudata*). This is a common but pretty species of evergreen greenhouse fern, of easy cultivation, and growing freely from spores. It does not exceed 8 inches in height, and is recommended for Wardian cases

CRESCENT DOODIA (*Doodia lunulata*) is less common than the last, of a similar character, but growing to twice the size. Though too large for the majority of cases, it makes a pretty evergreen fern for cultivation in a greenhouse. Both are Australasian species.

LARGE DOODIA (*Doodia maxima*). All these Doodias have a resemblance to the English Hard Fern. The present is a bold evergreen species capable of being grown in a greenhouse. The fronds often attain a length of 18 inches.

PROLIFEROUS WOODWARD FERN (*Woodwardia radicans*). This is a curious and interesting greenhouse fern, growing to a very large size, and bearing little plants of the same species at the tips of all the fronds, which are often 4 or 5 feet in length.

VIRGINIAN FERN (*Woodwardia Virginica*). A native of North America, with fronds 18 inches in length. It is sufficiently hardy to stand a mild winter out of doors.

FLORIDA FERN (*Woodwardia areolata*). Another North American species, of nearly the same size as the last

and, like that, is also hardy, and may be cultivated out of doors.

HONG KONG BRAINEA (*Brainea insignis*). This is a large evergreen species, suitable only for a greenhouse with plenty of room. The fronds exceed 4 feet in length, and the plant is at present very scarce.

PATERSON'S FERN (*Lomaria Patersoni*). An Australasian species, with narrow, undivided, strap-shaped, or sometimes lobed fronds, about 10 inches in length, and evergreen. Suitable for a greenhouse, and probably for a Wardian case.

NAKED LOMARIA (*Lomaria nuda*). Resembling the common Hard Fern, and about the same size, but not sufficiently hardy for outdoor cultivation. It may be grown readily, but has too much of the character of the common species to be strongly recommended.

ALPINE HARD FERN (*Lomaria alpina*) is nearly hardy, and resembles a stunted specimen of the common Hard Fern.

GILLIES'S HARD FERN (*Lomaria Gilliesii*) is a more attractive species, with fronds about 18 inches in length. It is a South American fern, and can only be grown in a greenhouse.

CAPE HARD FERN (*Lomaria Australis*). This is a large and showy species, with fronds nearly 2 feet in length. It is but little cultivated, and requires the protection of a greenhouse.

TASMANIAN HARD FERN (*Lomaria lanceolata*). Rather a pretty little fern of its kind, about 8 inches high, and suitable for greenhouse or case

DROOPING SPLEENWORT (*Asplenium flabellifolium*). This is a most desirable little species for a greenhouse, with long slender fronds, which droop over the side, when grown in a hanging basket, in a graceful manner. It is a native of New Zealand, and may be cultivated in the above-mentioned manner with very little trouble.

EBONY SPLEENWORT (*Asplenium ebumum*) is not an uncommon American species, with fronds about a foot in

length. Suitable for a cool shady greenhouse, and requiring very little attention.

SHINING SPLEENWORT (*Asplenium lucidum*). This is one of the finest of Spleenworts. Its shining evergreen fronds attain a length of 2 feet, and it may be cultivated in a greenhouse. This is a great favourite with fern growers.

BLUNT-LEAVED SPLEENWORT (*Asplenium obtusatum*). This is an Australasian species, having somewhat the character of the Sea Spleenwort, with fronds 9 or 10 inches in length. Easy of cultivation, and suitable either for a case or a cool greenhouse.

TRIANGULAR SPLEENWORT (*Asplenium palmatum*). This is a curious species, with fronds resembling an arrow-head or an ivy-leaf. A native of the south of Europe and the north of Africa. It is an evergreen fern, and may be cultivated in a greenhouse.

PROLIFEROUS SPLEENWORT (*Asplenium bulbiferum*). This is one of those interesting species which produce young plants on the surface of the fronds. It has an elegant appearance, with fronds nearly 2 feet in length, but requires plenty of room, and may be grown with ordinary care in a greenhouse.

DROOPING SPLEENWORT (*Asplenium flaccidum*). An evergreen fern with a drooping habit, in common cultivation, and readily grown in a greenhouse. It is a native of New Zealand, with deeply divided slender and graceful fronds of 2 feet in length.

NARROW-LEAVED SPLEENWORT (*Asplenium angustifolium*). A hardy North American species, which for that reason deserves to be better known. Although easily cultivated, and suitable for either outdoor or indoor fernery, it is rarely to be seen.

MICHAUX'S LADY FERN (*Athyrium Michauxii*). This is also a hardy fern from North America, and partakes somewhat of the character of our indigenous Lady Fern. The fronds are erect, and from 2 feet in length. It may be grown in the open air.

AUSTRALIAN LADY FERN (*Asplenium Brownii*). A large greenhouse fern with the habit of a Lady Fern and the fructification of a Spleenwort. The fronds are upwards of 2 feet in length, and require plenty of room. It is not uncommon, and easily cultivated.

HAIRY MAIDENHAIR (*Adiantum hispidulum*). This pretty little New Zealand fern will succeed very well in a closed case, is easily cultivated, and deserves to be much better known. The evergreen fronds seldom exceed 5 or 6 inches in length, and have a roughish hairy appearance.

HARDY MAIDENHAIR (*Adiantum pedatum*). More hardy than the British Maidenhair, this species will succeed either in the open air or in a greenhouse. The fronds usually exceed a foot in length, and it is therefore only suitable for large cases. The habit is quite different from the British species, and it is a native of North America.

ROUND-LEAVED FERN (*Platyloma rotundifolia*). This evergreen fern may be easily grown in a greenhouse or a closed case. The slender drooping fronds are about 12 inches in length, with rounded leaflets on opposite sides of the leaf-stalk, which latter is densely scaly.

MORETON BAY FERN (*Platyloma Brownii*). Has large leathery spear-shaped leaflets arranged on opposite sides of a dark brown leaf-stalk. It is only suitable for a greenhouse or a large case, as the fronds are upwards of a foot in length, and erect. It has the recommendation of being an easy plant to cultivate.

AUSTRALIAN MAIDENHAIR (*Adiantum assimile*). This fern is almost hardy, and may be grown in a greenhouse. It bears some resemblance to the European Maidenhair, with fronds about a foot in length. In a sheltered situation it will grow out of doors, but an unusually sharp winter would kill the plant, so that it is a hazardous experiment.

DOWNY MAIDENHAIR (*Adiantum pubescens*) is a fine species, and may be cultivated in a greenhouse. The

fronds are upwards of a foot in length, the leafy portion is divided into a number of branches spreading like the fingers of a hand, and bearing the angular leaflets in rows on opposite sides. It is a New Zealand species.

PLUMED MAIDENHAIR (*Adiantum formosum*). This beautiful fern requires but little skill in its cultivation, and will succeed in a greenhouse. The much-divided fronds are upwards of 18 inches in length, and evergreen. It is a native of New Holland, but has been known in this country for upwards of forty years, and is deservedly a favourite.

CUNNINGHAM'S MAIDENHAIR (*Adiantum Cunninghami*) is an evergreen fern of easy cultivation in a greenhouse. The fronds are 12 or 14 inches in length, and branching in the upper portion. This is also a New Zealand species, and in a large-sized Wardian case would be an acquisition.

AMERICAN DIPLAZIUM (*Diplazium thelypteroides*). In habit this fern resembles our Marsh Fern, but belongs to a different group. It is quite hardy, easy of cultivation, and no outdoor fernery should be without it. The fronds are about 2 feet in length.

AMERICAN ONOCLEA (*Onoclea sensibilis*). This is a common hardy fern from North America, with fronds nearly 2 feet in length, suitable for an outdoor fernery. The spore-cases are borne on a separate frond.

DECURRENT BOSS FERN (*Lastrea decurrens*). A hardy deciduous fern, having somewhat the character of the Marsh Fern. It is a native of China, and will generally stand the winter out of doors. The pale green fronds are upwards of a foot in length.

WHITE-COVERED BOSS FERN (*Lastrea marginalis*). This is another hardy fern, desirable for cultivation in an outdoor fernery. The covers of the spore-cases are white. It is a North American species.

SICKLE-LEAVED SHIELD FERN (*Polystichum falcinellum*)
A very ornamental fern from the Island of Madeira,

with fronds 12 to 16 inches in length. It is not hardy enough for an outdoor fernery, but is evergreen in a greenhouse, and a great favourite with fern growers.

BRISTLY SHIELD FERN (*Polystichum hispidum*). An evergreen fern from New Zealand, with fronds from about a foot in length. Only suitable for a greenhouse.

MEXICAN WOODSIA (*Woodsia mollis*). This is a hardy species, suitable for outdoor culture. The fronds are pale green, about 12 or 14 inches in length.

PERRIN'S WOODSIA (*Woodsia obtusa*) is a native of the United States, hardy, and therefore may be grown in the outdoor fernery. The fronds are rather smaller than in the Mexican Woodsia, and of a different character.

PROLIFEROUS BLADDER FERN (*Cystopteris bulbifera*). A native of the United States and Canada, easily cultivated, hardy, with fronds from a foot to a foot and a half long, and desirable for outdoor cultivation.

CINNAMON OSMUND FERN (*Osmunda cinnamomea*). A handsome species, quite distinct from our indigenous Royal Fern; native of North America and other places. Height from $2\frac{1}{2}$ to 3 feet, and sufficiently hardy to stand the winter out of doors.

CLAYTON'S OSMUND FERN (*Osmunda Claytoniana*) is another hardy North American species, about the same size, but very different from the Cinnamon Fern.

LARGE-LEAVED CYRTOMIUM (*Cyrtomium falcatum*). This is in reality a hardy fern, though not often treated as such. It is an evergreen species from Japan, of easy cultivation, with rich dark fronds upwards of 18 inches in length, and very desirable for an outdoor fernery.

AMERICAN SHIELD FERN (*Polystichum acrostichoides*). A hardy fern of pleasing appearance, easily cultivated, and desirable for an outdoor situation. The fronds are about 2 feet in length.

GOLDIN'S BOSS FERN (*Lastrea Goldiana*) is a hardy North American species, deserving of attention, and easily grown out of doors. The fronds are 1 to 2 feet in length.

SIEBOLD'S BOSS FERN (*Lastrea podophylla*). A very distinct and attractive half-hardy fern from Japan, with fronds a foot in length, and large feathery leaflets. It will stand an ordinary winter out of doors.

TASMANIAN SHIELD FERN (*Polystichum vestitum*). This fern is very different from our indigenous species of Shield Fern, with fronds about a foot in length. It requires indoor cultivation.

PALMATE CLIMBING FERN (*Lygodium palmatum*). This is almost the only climbing fern which will succeed in a greenhouse. It is a native of North America, and is a highly desirable species.

KIDNEY-LEAVED BRISTLE FERN (*Trichomanes reniforme*). A native of New Zealand, with a creeping root-stock, and kidney-shaped fronds from 4 to 6 inches high. It may be cultivated in a closed case.

VEINED BRISTLE FERN (*Trichomanes venosum*). This is also capable of cultivation in a closed case. The fronds are from 3 to 4 or 5 inches in height. It is an Australian species, quite distinct from the above and the Killarney Fern.

HARE'S FOOT FERN (*Davallia Canariensis*). This is a well-known greenhouse fern, a native of the Canary Islands and Southern Europe. The fronds are about a foot in length.

NEW ZEALAND DAVALLIA (*Davallia Nova Zelandiæ*). It is undoubtedly a beautiful fern, but requires care in its cultivation. The fronds are 9 or 10 inches in length, and as it prefers a moist atmosphere, it would probably succeed in a closed case as well as in a greenhouse.

FILMY TODEA (*Todea pellucida*). This New Zealand fern grows to a foot in height. It should be cultivated under glass, with similar treatment to Filmy Ferns.

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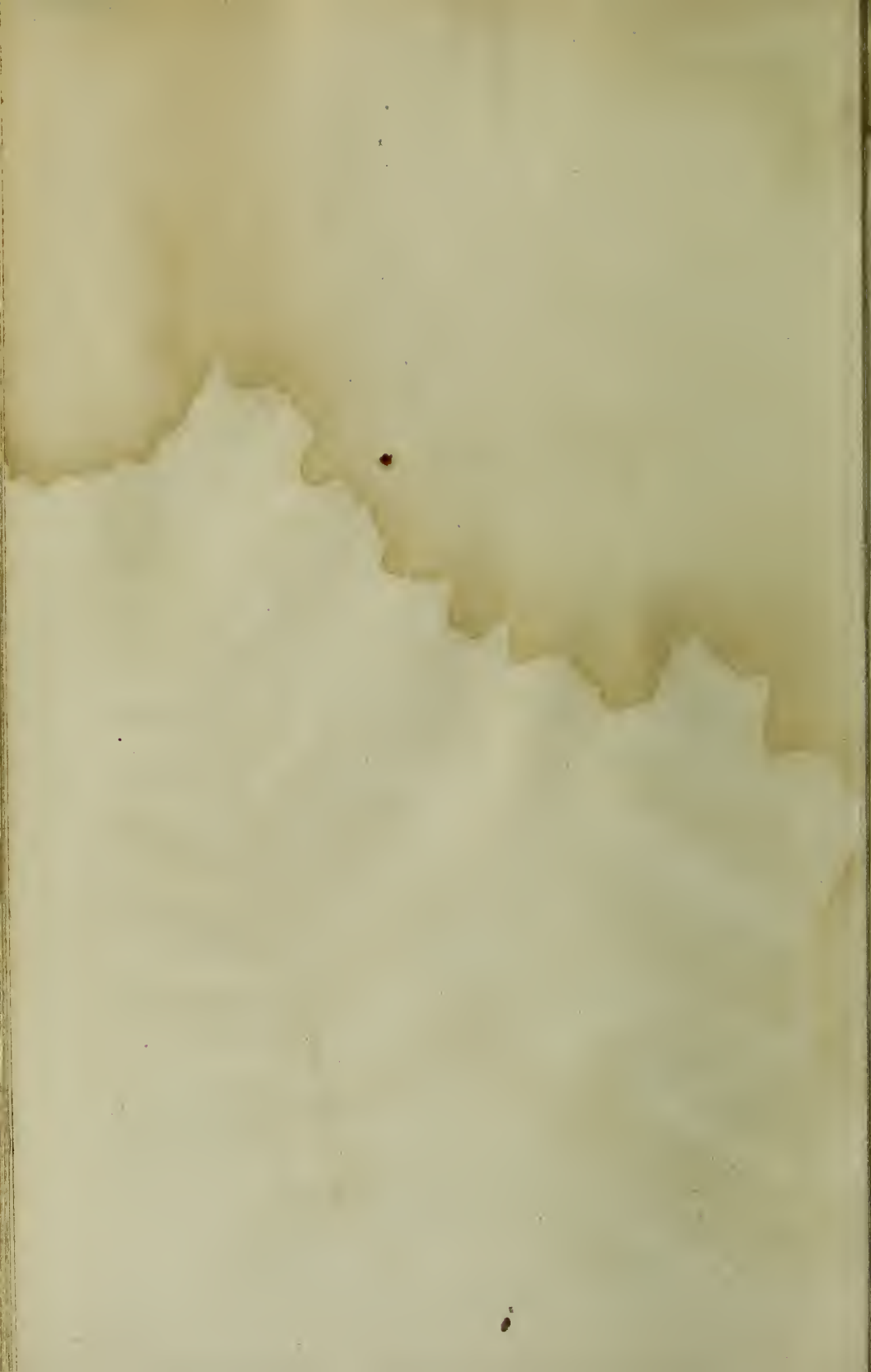




1. Common Polypody.

2. Beech Fern.

3. Limestone Polypody.

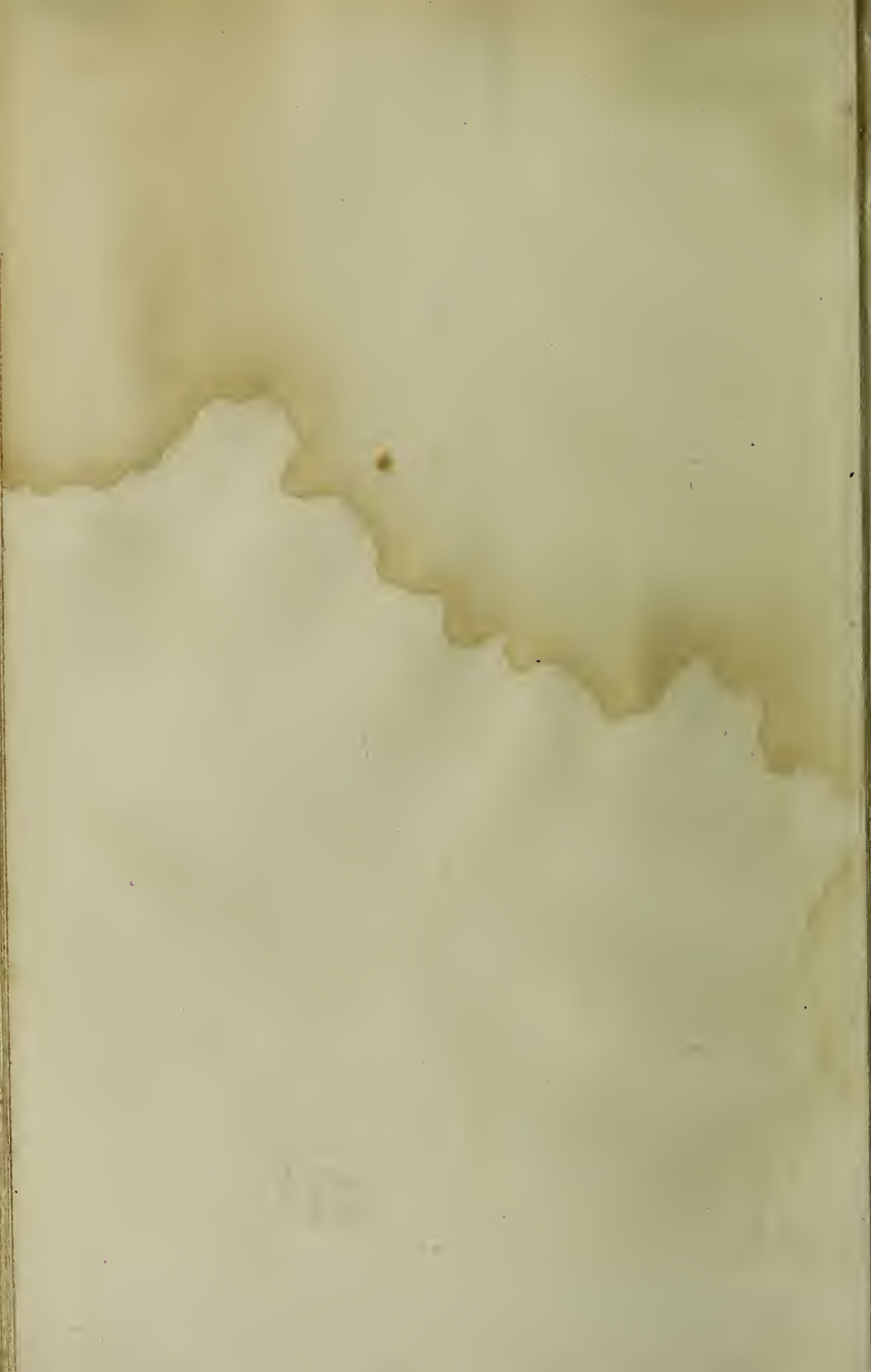




1. Male Fern.

2. Barren Parsley Fern,

3. Fertile Parsley Fern.



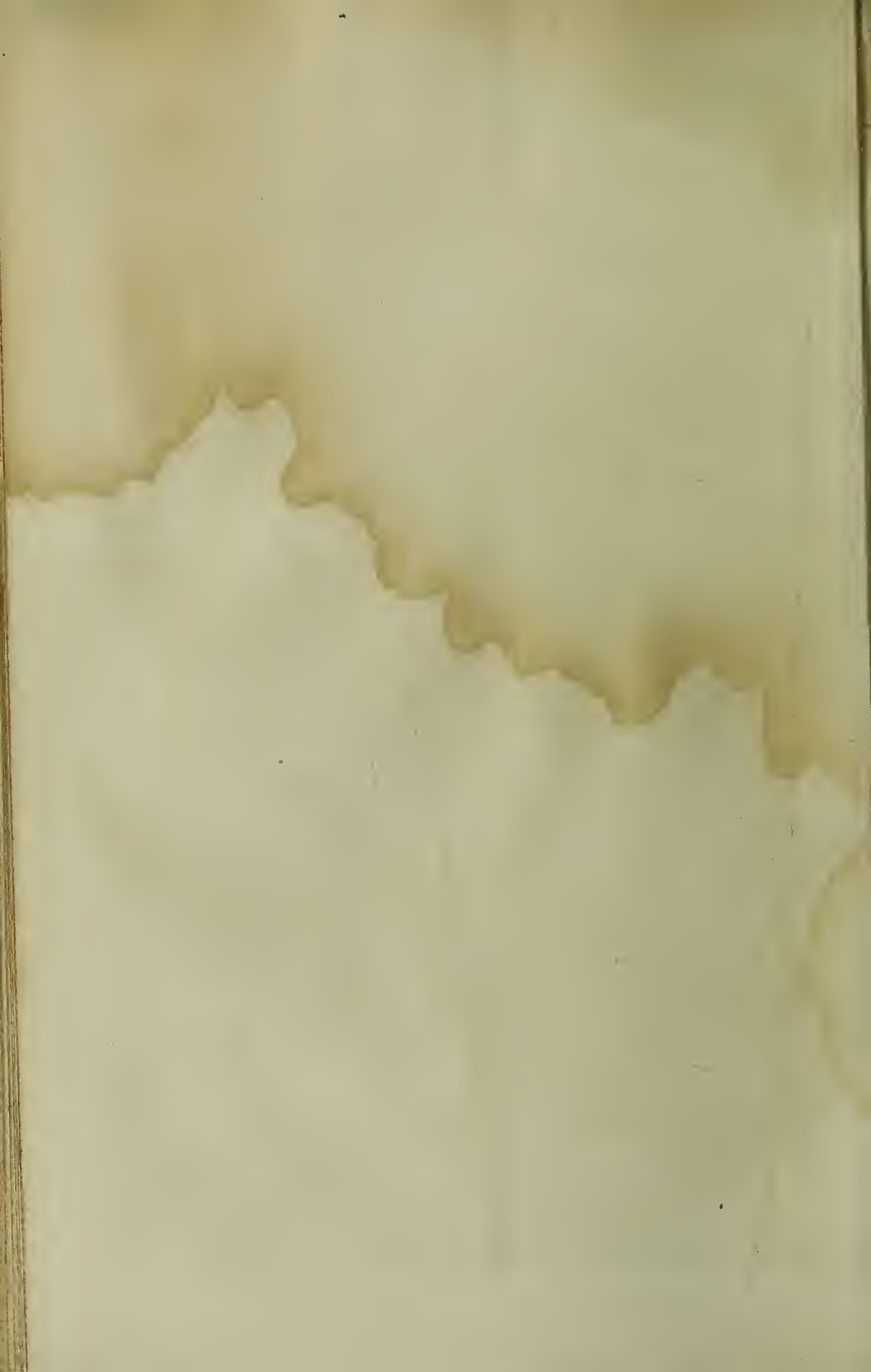
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2



1. Mountain Boss Fern.

2. Crested Boss Fern.





1. Stiff Boss Fern.

2. Spiny Boss Fern.



1. Broad Boss Fern.

2. Holly Fern.



1. Prickly Shield Fern.

2. Sea Spleenwort.



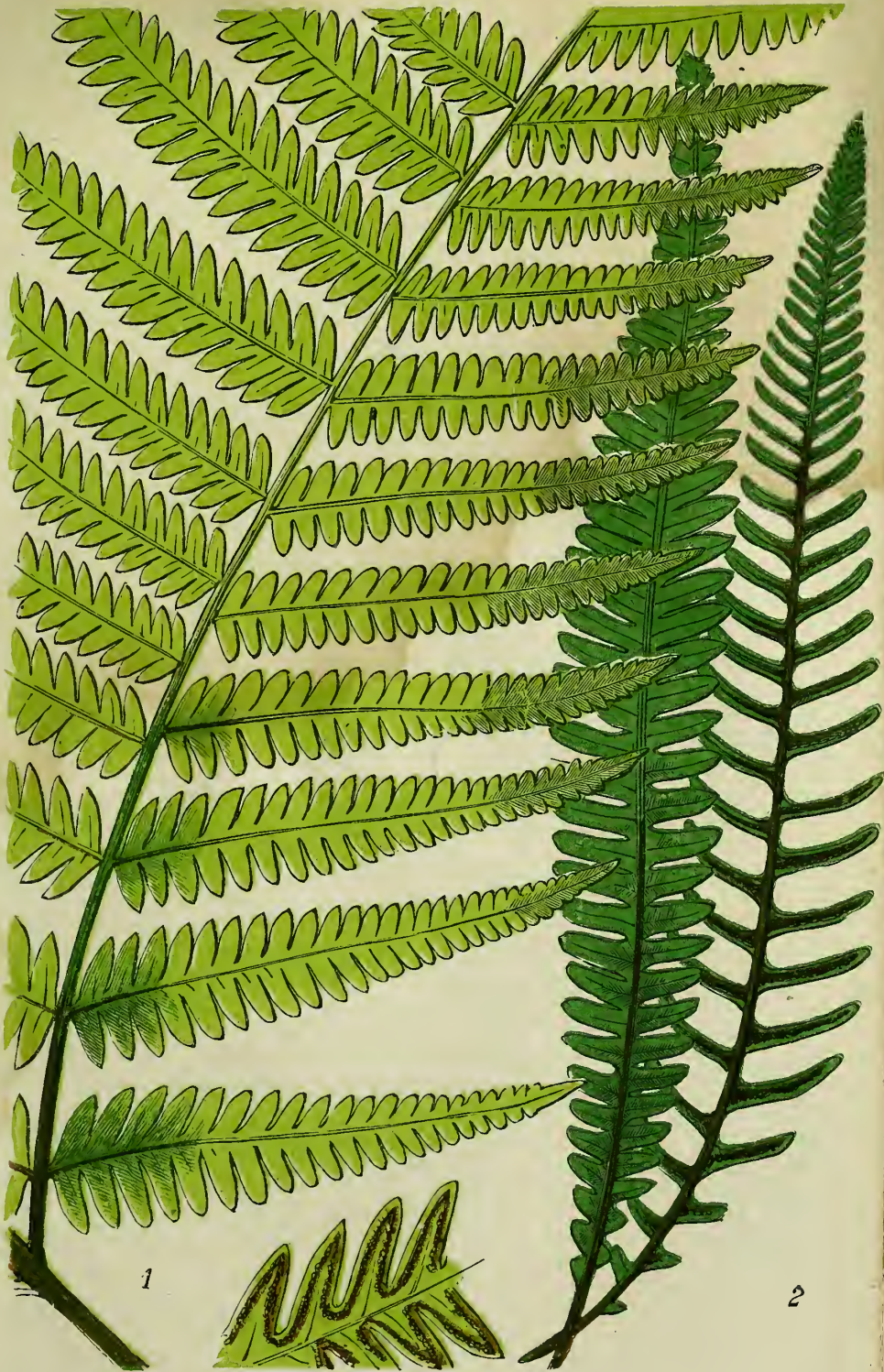
1. Soft Shield Fern.

2. Bristly Spleenwort.



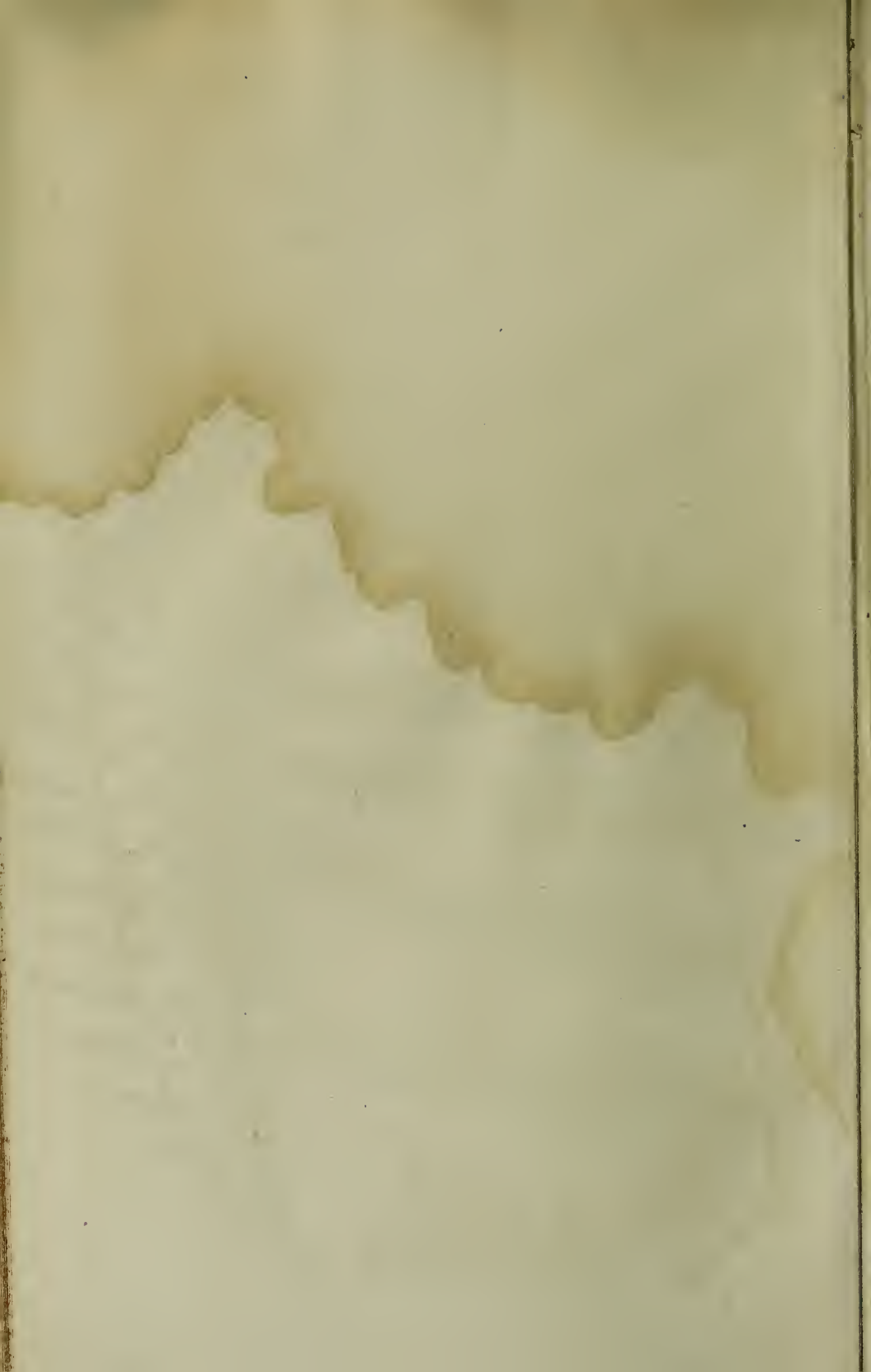
1. Lady Fern.

2. Black Spleenwort.



1. Bracken.

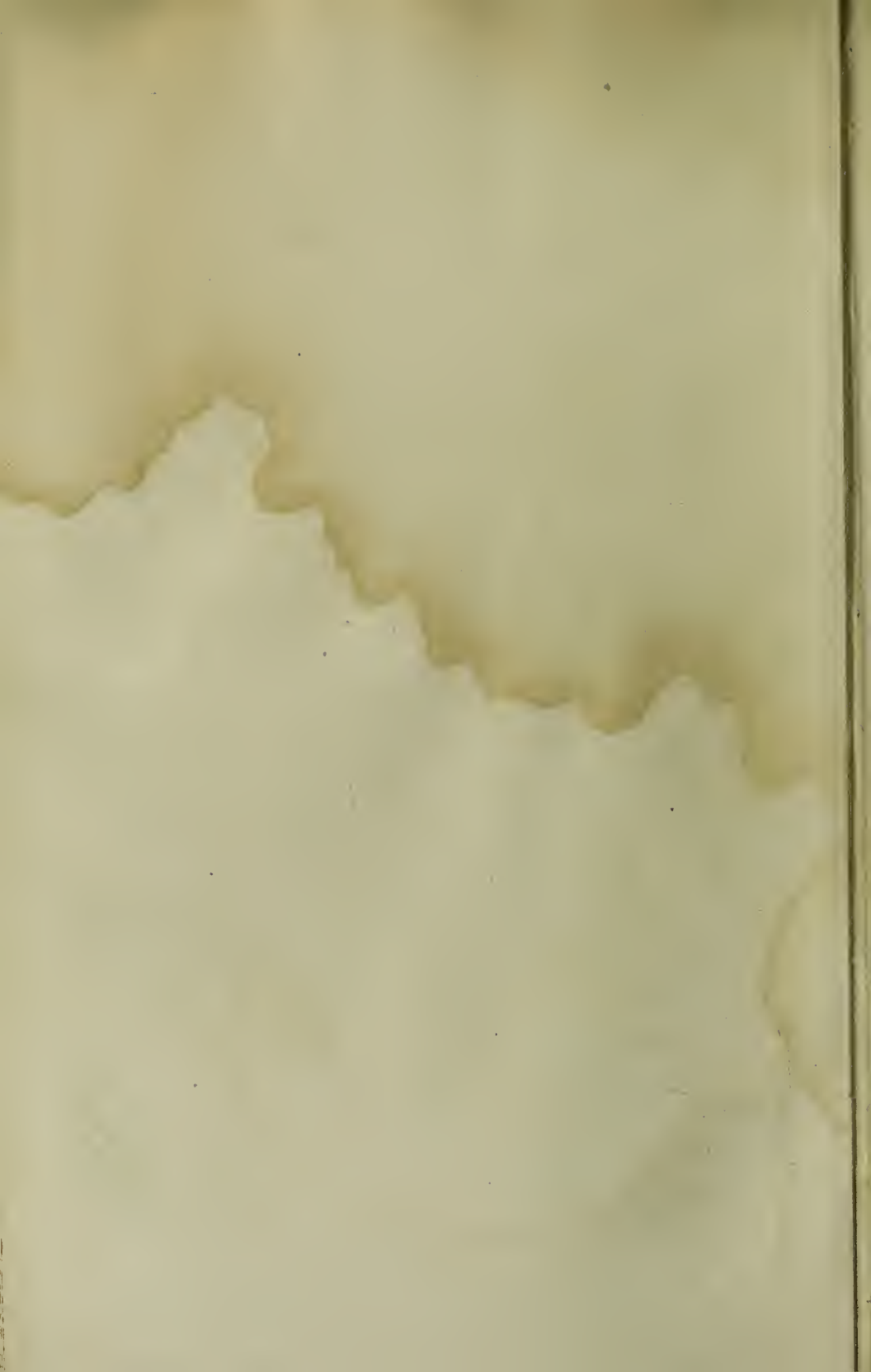
2. Hard Fern.





1. Mountain Bladder Fern.

2. Brittle Bladder Fern.





1. Maidenhair.

2. Killarney Fern.

